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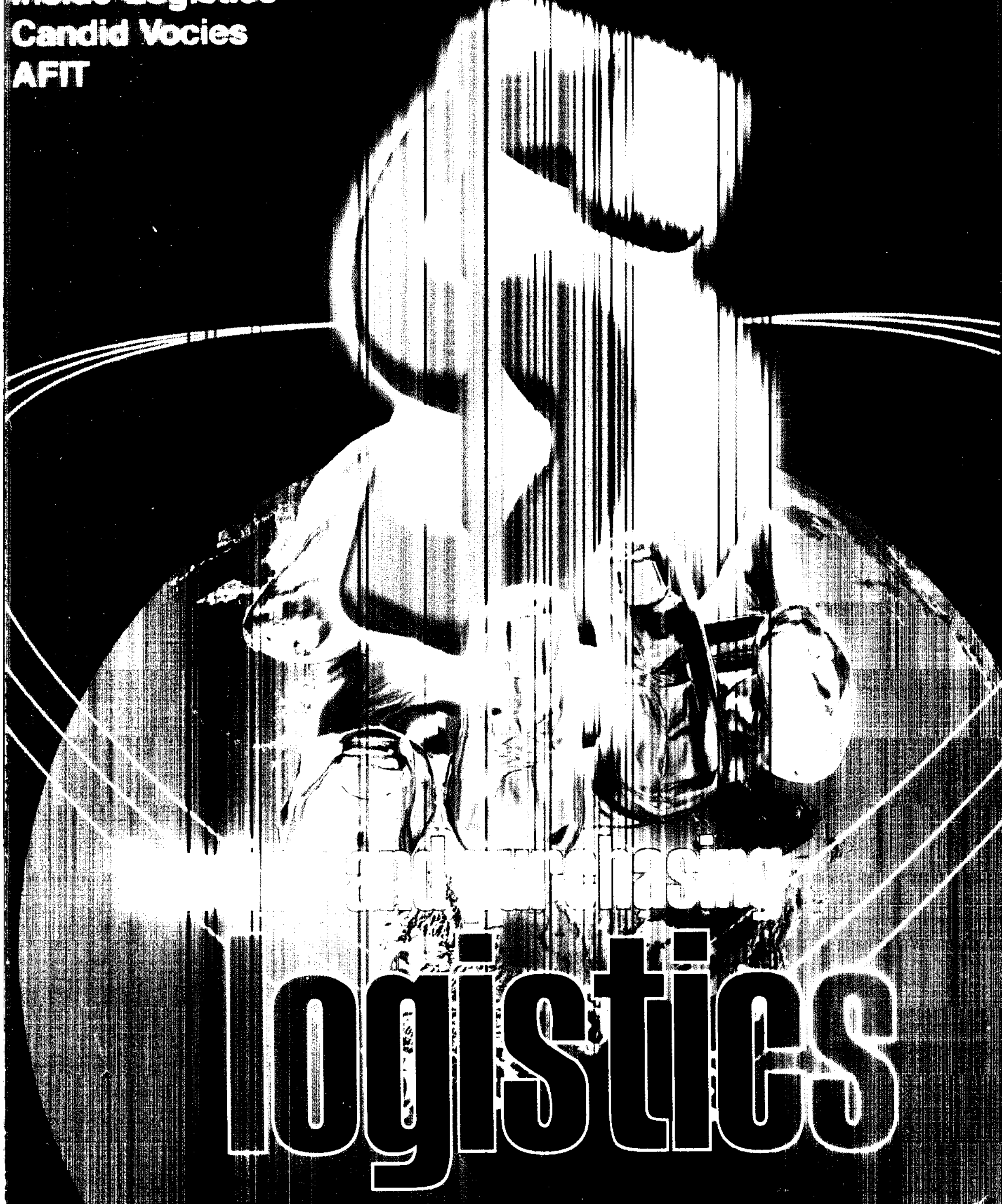

and purchasing logistics

Centralize Purchasing Power: Why Air Force Leadership Should Care

Funding Support: Capabilities-Based Programming

Volume XXVIV, Number 1
Spring 2005

AIR FORCE JOURNAL of LOGISTICS

Volume XXVIV, Number 1 Spring 2005 AFRP 25-1

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New Journal Telephone Numbers - DSN 596-2335/2357 or Commercial (334) 416-2335/2357

The *Air Force Journal of Logistics* (*AFJL*), published quarterly, is the professional logistics publication of the United States Air Force. It provides an open forum for presenting research, innovative thinking, and ideas and issues of concern to the entire Air Force logistics community. It is a nondirective publication. The views and opinions expressed in the *Journal* are those of the author and do not necessarily represent the established policy of the Department of Defense, Department of the Air Force, the Air Force Logistics Management Agency, or the organization where the author works.

The *Journal* is a refereed journal. Manuscripts are subject to expert and peer review, internally and externally, to ensure technical competence, accuracy, reflection of existing policy, and proper regard for security.

The publication of the *Journal*, as determined by the Secretary of the Air Force, is necessary in the transaction of the public business as required by the law of the department. The Secretary of the Air Force approved the use of funds to print the Journal, 17 July 1986, in accordance with applicable directives.

US Government organizations should contact the *AFJL* editorial staff for ordering information: DSN 596-2335/2357 or Commercial (334) 416-2335/2357. *Journal* subscriptions are available through the Superintendent of Documents, US Government Printing Office, Washington DC 20402. Annual rates are $15.00 domestic and $18.75 outside the United States. Electronic versions of the *Journal* are available via the World Wide Web at: http://www.aflma.hq.af.mil/lgj/Afjlhome.html. The *Journal* editorial staff maintains a limited supply of back issues.

Unsolicited manuscripts are welcome from any source (civilian or military). They should be from 1,500 to 5,500 words. The preferred method of submission is via electronic mail (e-mail) to: **editor-AFJL@maxwell.af.mil**. Manuscripts can also be submitted in hard copy. They should be addressed to the *Air Force Journal of Logistics*, 501 Ward Street, Gunter Annex, Maxwell AFB, AL 36114-3236. If hard copy is sent, a 3.5-inch disk, zip disk, or compact disk containing an electronic version of the manuscript should accompany it. Regardless of the method of submission, the basic manuscript should be in Microsoft Word or WordPerfect format, and all supporting tables, figures, graphs, or graphics must be provided in separate files (preferably created in Microsoft Office® products; if Microsoft Excel is used to create any of the charts or figures, the original Excel file must be supplied). They should not be embedded in the manuscript. All submissions will be edited in accordance with the *AFJL Manual for Style*.

funding and purchasing

logistics

Centralize Purchasing Power: Why Air Force Leadership Should Care
Funding Support: Capabilities-Based Programming

This edition begins with "Centralize Purchasing Power: Why Air Force Leadership Shourd Care." In this illustrative piece the authors make a number of valid points. Meaningful institutional change toward centralized purchasing fundamentally can improve the Air Force's effectiveness and efficiency. Using the commercial best practice of *commodity councils*, Air Force contracting has the opportunity to transition to a construct of strategic leverage quickly while minimizing the negative impact of radical change upon overarching Air Force operations. Within today's contracting structure, the basic hierarchy already exists, which could support this recombination of people, networks, culture, processes, and structure. The senior contracting representatives within the Air Force's headquarters and major command structures could transition easily to more strategic roles if the Air Force focused the appropriate level of attention on this issue. Air Force contracting has to move beyond tactical sourcing and compliance-oriented oversight, and contracting personnel have to get in front of user's requirements and be prepared to respond to customer requirements via a quick, seamless, and transparent methodology. Immediate further study is warranted in this regard.

The second feature, "Funding Support: Capabilites-Based Programing, looks at the question "Can a method be developed to assist squadron and group logistics commanders to secure required mission funding" The author's answer is a resounding yes. Squadrons and groups must invest time and thought to compete effectively for funding resources at the MAJCOM, Air Force, and DoD levels. In other words, they spend the *time* to determine the requirements necessary to support the peacetime and wartime missions as well as the *thought* in applying the financial resources in a traceable manner. The key is to establish the fundamental requirements supporting the peacetime and wartime missions. When established, the requirements clarify not only the shortfalls identified from the logistics perspective but also mission impact to senior leadership. Once leadership understands the implications to the mission, more effective prioritization of resources throughout the unit is achieved more easily.

Editor's Note—Prologue to "Centralize Purchasing Power: Why Air Force Leadership Shourd Care"

In May 2004 when Majors Reese and Pohlman completed, "Centralized Purchasing Power: Why Air Force Leadership Should Care," the Air Force had just completed a 14-month effort to reengineer Air Force Materiel Command (AFMC) sustainment business processes. This transformation effort, culminates several years of aggressive change to AFMC's sustainment acquisition processes—strategic sourcing, purchasing and supply chain management (PSCM), and commodity councils. AFMC developed a roadmap for commodity councils including organizational design, resource requirements, position descriptions, training requirements, and a spiral implementation plan. Since February 2004, they have stood up eight sustainment commodity councils. These councils are focused on support equipment, secondary power, propulsion, landing gears, aircraft accessories, instruments, electronics/communications, and aircraft structures. The spend for the them ranges from $334 for the Secondary Power Commodity Council to more than $4.2B for Propulsion. Overall, the eight commodity councils manage 91.9 percent of total AFMC sustainment dollars ($10.3B for fiscal years 2001-2003).

AFMC's initial strategic sourcing efforts resulted in the award of 28 contracts. One example is a contract awarded to Hamilton Sundstrand to support Air Force and Defense Logistics Agency managed items. This award reduced the total number of contracts for these items from 224 to 1, reduced acquisition lead time from 106 to 10 days, and reduced prices by 10 percent. It's expected the savings will be $116M over the life of the contract.

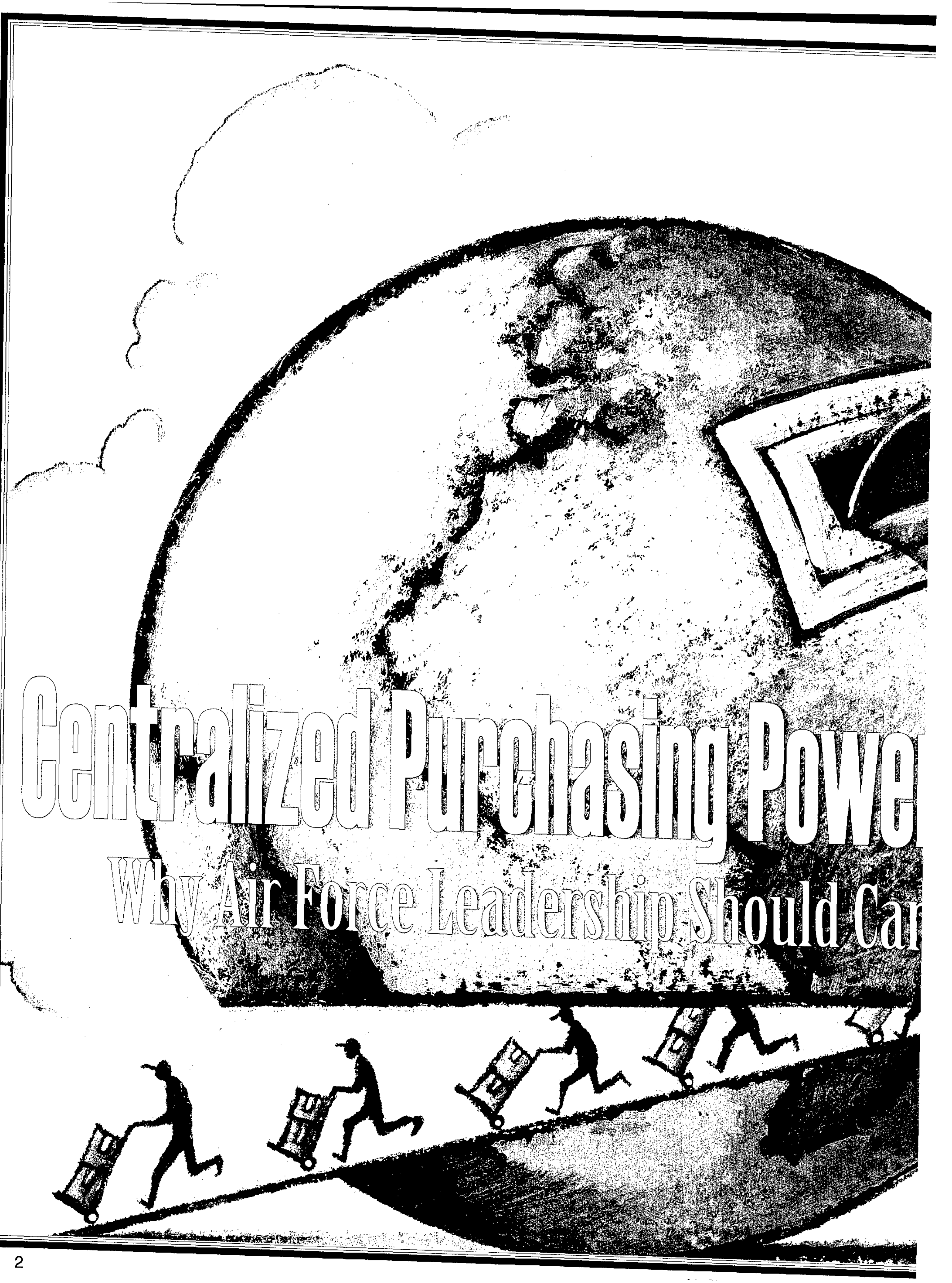
The Support Equipment Commodity Council reduced proliferation of oscilloscope configurations from 190 to 3. Total contracts have been reduced from 14 to 1. The Secondary Power Commodity Council is executing a strategy whereby a supplier provides all auxiliary power unit support to AFMC's organic depots on a fixed hourly basis, including parts This reduced the number of repair contracts from 83 to 5.

AFMC is also actively participating in establishing Department of Defense-level commodity councils for bearings and microelectronics.

At the Air Force level, improved strategic sourcing includes establishing Information Technology and Medical Services Commodity Councils.

Another important element of PSCM is improving supplier relations. Under the Strategic Supplier Relationship Management (SSRM) initiative, AFMC assigned senior civilians to manage the relationship with its top 21 suppliers. These suppliers represent approximately 92.5 percent of AFMC's total spend for spares and repairs. In Aug 2004, General Gregory Martin, AFMC Commander, convened a Strategic Supplier Executive Summit with senior executives from the Top 21 suppliers, air logistic center commanders, and the senior civilians involved in the SSRM initiative to share his vision concerning supplier relationship management and commodity councils. The second Strategic Supplier Executive Summit is scheduled for Oct 2005. Its purpose will be to review progress and introduce a supplier scorecard.

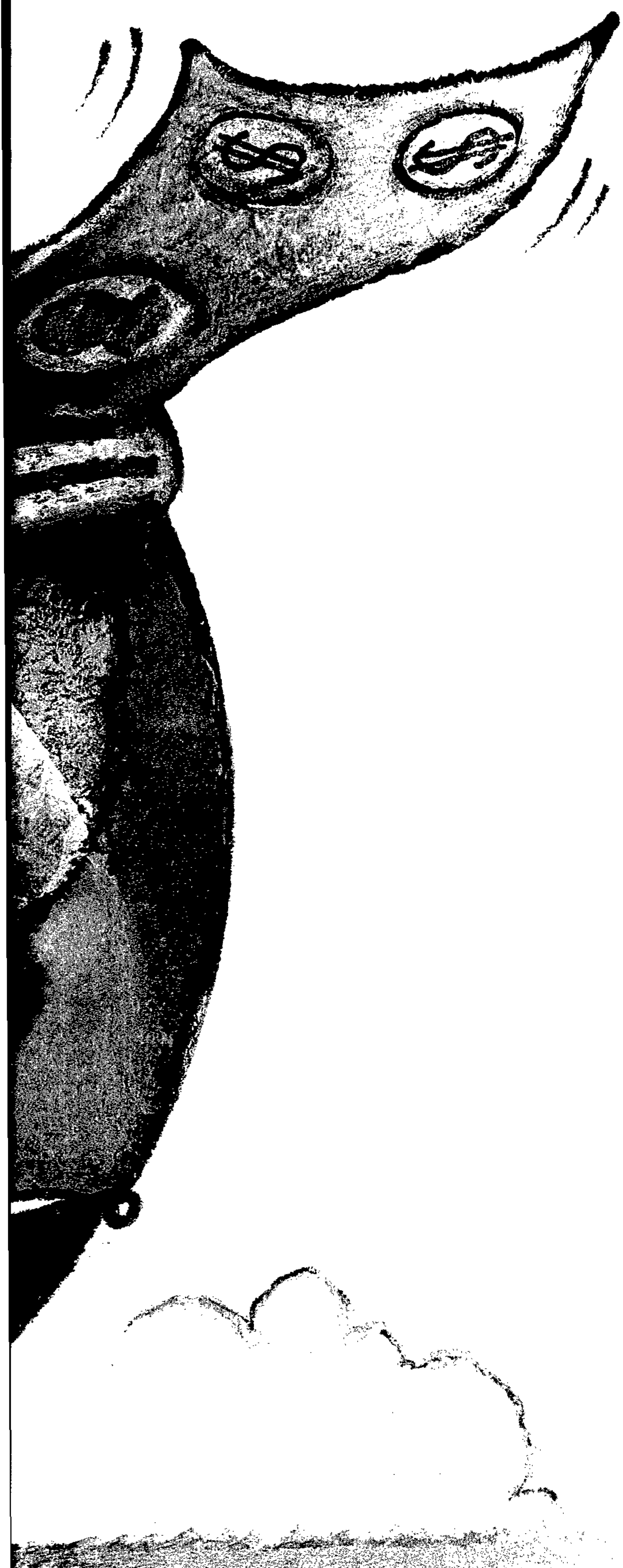
AFMC is on the path to meeting Air Force transformation goals—20 percent reduction in materiel costs, 20 percent increase in materiel availability, and a 50 percent reduction in cycle time.



Centralized Purchasing Powe

Why Air Force Leadership Should Car

Major David L. Reese, USAF
Major Douglas W. Pohlman, USAF



Special Feature

Introduction

Ten years ago when IBM and its procurement competitors were vertically integrated, procurement was not mission critical. It was doing tactical buying. Today procurement is strategic. Buying professionals went from being guardians of secret information to facilitators of communications among manufacturing, engineering, and suppliers' people and their suppliers. We have learned to communicate and team across divisions. As a result, we are much stronger. We truly have come a long way.

—R. Gene Richter

During the final 2 years of a highly successful life, characterized by service before self, Gene Richter, "One of the great figures in purchasing and the supply chain of the Twentieth Century," graciously dedicated a great amount of his valuable time in patriotic service to the Air Force's procurement transformation efforts.[1] Serving at the procurement helm for Ford Motor Company, Black & Decker, Hewlett-Packard, and IBM, he developed an unmatched reputation for success, with his last three organizations each winning *Purchasing* magazine's Medal of Excellence—the commercial procurement community's highest honor.[2] With more than 40 years of unequivocal procurement success to support his winning purchasing philosophy, Richter's message to the Air Force's contracting community was identical to his message to the commercial CEOs of today's medium and large corporations: "Centralize procurement!"[3]

Although Richter's years of proven experience alone justify the Air Force's seriously considering his message of centralized procurement, the overwhelming record of success from companies around the globe also endorses his guidance. As outsourced goods and services continued to grow as a dominant factor of revenue spend over the last several years, many successful CEOs realized the strategic value of highly focused procurement organizations within their corporations and are now demanding *assertive energy* from supply management leaders.[4]

In addition to the evidence of numerous public reports on the savings achieved by centralized procurement initiatives within major corporations around the globe, the US General Accounting Office's (GAO) September 2003 report on service contract management concurred that leading commercial companies are saving "10 to 20 percent of their total procurement costs" while

improving their competitiveness and customer service through strategic purchasing efforts.[5] Under Richter's guidance, IBM certainly experienced the inherent value of strategic procurement after revamping its purchasing department in the mid-1990s to stop the company from *bleeding red ink*, ultimately helping return the company to profitability.[6] After all, the impact of strategic purchasing on a company's bottom line is clearly evident when you consider that a dollar saved in purchasing costs is a full dollar of resources that an organization can employ elsewhere.

Beyond the obvious advantages of leveraged buying power, strategic procurement is a key enabler of effective supply chain management (SCM).[7] Motorola's Personal Communications Sector, the world's second largest cell phone manufacturer, acknowledged this often-overlooked fact as it placed Theresa Metty, one of the nation's top-ranked purchasing professionals, in charge of its SCM function in 2000. Through Metty's campaign to reduce supply chain complexity and leverage centralized purchasing power, Motorola PCS successfully increased its market share, "squeezed $2.6B in costs out of its supply chain, reduced inventory by $1.4B, and improved its customer response time 40 percent" in the following 2 years.[8]

Metty, who was promoted in 2003 as Motorola's senior vice president and chief procurement officer, introduced the centralized commodity council concept at Motorola PCS, better equipping the organization to stay ahead of economic developments, technology shifts, changing demand, supply restrictions, and bottlenecks.[9] Since 2002, Metty also has volunteered her acclaimed expertise to senior Air Force procurement executives. Her message, like Richter's, has been for the Air Force to capitalize on the intrinsic supply chain value of strategic purchasing by centralizing procurement functions across the service.

Despite the overwhelming evidence of proven success within the commercial marketplace and the declining health of the Air Force's increasingly complicated supply chains, most Air Force personnel are unaware of the potential that increased centralized procurement offers in terms of effectiveness and efficiency.[10] Within the commercial purchasing world, the "pendulum swings every few years" between decentralized and centralized purchasing functions, often because of external influences of market responsiveness and organizational empowerment.[11] However, the business side of the Air Force consistently has fixated on the doctrinal mantra of decentralized execution, showing little application for the concept of centralized control, except within discussions regarding the allocation and application of airpower employment assets (that is, weapon systems).[12] Many operational persons who are aware of the integrated supply chain potential may oppose the perceived increase in execution control by headquarters or other agents simply because of this embedded cultural mindset within the Air Force.[13]

Because of the overwhelming complexity of the multifaceted logistics issues of today, the Air Force certainly has the right to be leery of yet another improvement initiative promising relief from longstanding concerns. Such skepticism, resistance to change, and resistance to external controls are natural and healthy traits of any large organization. However, the Air Force must ensure its longstanding attachment to decentralized operations is not yesterday's answer to today's problems.[14] When the preponderance of evidence is overwhelmingly in favor of centralized procurement and when the cost for failing to transform reaches an unacceptable threshold of tolerance, the time for organizational resistance is over.

Despite several years of effort to gain better control of its large and growing purchasing machine, the Air Force's pace toward leveraged buying is still bureaucratically slow.[15] Centralization proponents would argue that Air Force leadership must pay increased attention to this issue of strategic purchasing.[16] Given the size and scope of Air Force supply chain activities and the highly decentralized nature of the organization itself, any successful effort toward increased centralization will require executive sponsorship since they have the "ultimate responsibility for strategy, structure, and culture."[17] Although the savings promised by such an initiative should be reason enough to garner leadership's undivided attention, this issue is not simply about efficiency. More important, as Air Force leaders should note, this concept of leveraged centralized purchasing power is fundamentally about increasing the Air Force's warfighting effectiveness.[18]

Notably, successful centralization of the procurement function within the Air Force's highly decentralized supply chain network will have wide-ranging effects on the organizational structure of the Air Force tomorrow. As with every large and multifaceted organization, there are right ways to centralize control of critical operations, and there are wrong ways.[19] Every enterprise is potentially unique. As such, Air Force leaders must be aware, not only of the operational promise but also of the organizational impact. Failure by the Air Force's senior leadership to appreciate the underlying implications or failure to support this issue likely would compromise any potential improvements in capability.[20]

Centralization Trends within the Commercial Procurement Community

[The big conglomerates] in effect, said, "We can't centralize purchasing, we'll have to let every plant have its own purchasing activity." Those days are over. They're over because the most successful and most competitive companies are now putting a strategic value on supply. That's why I report right now to the chairman of the company. I think one of the things we're seeing in American business is a resurgence in the strategic nature of purchasing. And to do that, we've got to get out of transactional buying.

—Tom Stallkamp

During the 1970s and 1980s, the executive management teams of large, sprawling, and growing enterprises mitigated the effects of their enormous and complicated supply chains by diversification and decentralization.[21] Large corporations segmented their operations by divisions and gave considerable execution power to their decentralized business units, as previously expressed by Tom Stallkamp, former vice president and chief procurement officer for Chrysler Corporation. Within these business units, many plants and offices gave similar latitude and control to individual functional silos (for example, engineering, purchasing, inventory management, manufacturing, and marketing sales) within their overarching processes. Because of the inevitable *conflict and suboptimization* resulting from the

fragmented processes characterized by no single entity's being clearly responsible for final products, total quality management and process advocates, such as Michael Hammer, arrived on scene in the 1990s arguing for the reengineering of business processes to better provide an end-to-end focus.[22]

Purchasing Today

From a process viewpoint, the purchasing function is extremely critical because, "perhaps more than any other group, supply managers can affect quality at the source because they actually determine the source for most supply chain inputs."[23] Acknowledgment of this basic fact led many organizations in the 1990s to encourage their functional stovepipes involved in the procurement process to increase the cross flow of information among organizational silos. As a result, the purchasing function became more visible within the larger structure of organizations.[24] Engineers began to work with procurement personnel earlier in the design stages to ensure technical specifications were scoped and understood correctly, purchasing officers began to encourage increased supplier participation in the design process to prevent unnecessary technical problems, and inventory management personnel began to share information with purchasing personnel to help eliminate supply shortages and overages.[25] Today, such collaboration between supply chain participants is increasingly normal in business operations.

Beyond the obvious benefits created by the basic integration of previously fragmented processes, however, the purchasing communities of large corporations found a tremendous amount of supply chain waste within their own functional silos because of decentralized practices across the corporation.[26] At the most simple level, one can contrast decentralized buying to the economics of buying in bulk. If a purchaser needs the same item over and over again, it typically will get a better price by buying in volume rather than from buying items individually. If the purchaser consistently gives its business to the same supplier, that supplier is more likely to offer better terms and pricing than a supplier used only sporadically.

Certainly, *economy of scale* is not a new concept. Farming cooperatives, distributors, third-party logistics providers, and buying consortiums are all examples of using the power of combined individual needs to gain leverage. Most individuals also are aware of the power of financial consolidation and leverage. They utilize mutual funds to gain the additional financial leverage of other people's money, and they contribute to 401K investment opportunities to team their money with that of fellow workers. They shop at Costco and Sam's Wholesale to get better pricing from bulk purchasing, shop at Wal-Mart to benefit from the low pricing offered by an incredible sales volume, and (perhaps most basically) understand the value of buying 12-packs versus 6-packs. Individuals understand the power of leveraged purchasing in their personal finances, and leading corporations are keenly aware of the leverage buying advantage as well.[27]

Accordingly, CEOs and other business executives are looking for their procurement organizations to contribute directly to the financial bottom line, and smart purchasing personnel are finding ways to translate their organization's return on investment into language that the CEO can understand and appreciate.[28] After all, if the purchasing function is not able to measure its contribution objectively to the success of the larger organization, it is not likely that the organization will believe in or support the procurement

Article Highlights

The Air Force's pace toward effectively leveraging its $69B purchasing power is bureaucratically slow.

In the face of commercial success with centralized procurement efforts, most Air Force members are unaware of the potential increase centralized procurement offers in terms of effectiveness and efficiency. Highly successful procurement executives have advised Air Force leadership to realize the value of strategically focused procurement and to demand more from their supply management leaders to stay ahead of economic developments, technology shifts, changing demand, supply restrictions and bottlenecks. A strategic approach is necessary to correct underlying supply chain issues and to better stretch declining resources toward effectiveness and efficiency goals.

function's initiatives.[29] Although the nuances of supply chain improvements are not always clearly evident, executives do understand monetary savings and performance improvements and will support the motivated efforts of procurement organizations, bringing solutions and savings to the corporate table.[30] Effective leaders of purchasing functions contribute directly to the success of their organization and find meaningful ways to communicate their performance to the strategic business level.[31]

In the world of rising material and capital costs and increasing competition, today's medium and large organizations consistently are finding savings opportunities throughout the spectrum of purchased goods and services.[32] Moving from decentralized to centralized purchasing, the *economy of scale* principle nearly always holds true, and the intrinsic benefits of supply chain optimization afforded by better control and integration of functional activities involved in the procurement process are creating a positive influence on the financial bottom line. Successful organizations consistently are translating those efficiency savings directly into increased effectiveness and are gaining the attention and support of senior leadership along the way.[33]

Snapshots of Centralized Success

The following selected vignettes offer a small glimpse into the power of leveraged spending that leading corporations around the world have experienced recently.

Sanmina—SCI Corporation. As an electronics contract manufacturer within a $125B market, Sanmina embraced the core concepts of supply chain management and increased its focus on the global supply base. In 2001, by emphasizing supplier selection, supplier management, supplier development, and technology convergence through a dedicated core of procurement and commodity experts, Sanmina reduced the corporation's inventory by almost 90 percent and nearly tripled its inventory turns. By continuing to attack the *islands of centralization* at its factory level, Sanmina projected continued improvements of approximately the same magnitude over the next year. The benefits of centralized procurement and integrated supply chain management are readily apparent, as its supply chain vice president testified, "We don't do a lot of part shortage meetings anymore."[35]

ChevronTexaco Corporation. In 2001, ChevronTexaco (CT) created a *center led strategic procurement organization* with decentralized operational procurement organizations reporting directly to it and expanded the center-led focus from materials-only procurement to materials, services, and logistics procurement. Utilizing strong top management support from the CEO downward, the resulting corporate leverage enabled CT's procurement organization to save 34.3 percent in oilfield trucking costs, 39.3 percent in office supply costs, 22.4 percent in office furniture costs, 31.1 percent in telecommunications expenses, and more than $10.3M in information technology hardware. By consolidating suppliers, creating *competitive threat* with their incumbent suppliers, negotiating heavily, and obtaining tremendous consensus with its supply chain partners, CT also was able to save 18.5 percent in its refinery maintenance costs for its six US refineries. Notably, CT executed its consolidation and improvement efforts while also achieving outstanding goals in supplier diversity and small business utilization.[36]

Leading industry firms are reducing purchasing costs radically—over and over again—year after year.

- Timken—10 percent reduction across safety supplies and then another 23 percent by consolidating spend via third-party firm.
- Whirlpool—$200M reduction in a single year (15-20 percent targets).
- Ingersoll-Rand—$300M (direct) and $100M (indirect) savings achieved (average 17 percent—up to 50 percent in certain commodities).
- Textron—$100M saved in purchase costs in 1 year alone.
- DuPont—$400M (14 percent) first year—next year's goal = $1B.
- Kodak-$1.4B—double-digit annual productivity targets again.
- Englehard—25 percent productivity improvement goals per year.

Centralization and volume leverage are key factors!

Table 1. Successful Centralization Results[34]

Summary

Today's commercial procurement community is leaning heavily toward the organizational concept of centralized procurement. Although the large and medium corporations around the globe that are centralizing their purchasing efforts use several different organizational constructs, the overarching objective is typically the same. To the maximum extent possible, the entire organization should be corporately leveraging its purchasing volume and customer and supplier relationships through strategic planning and execution. Indeed, companies that are striving to ensure supply of critical goods and services are finding a decentralized strategy that promotes fragmented processes is fundamentally detrimental to their goal.

"Cost reduction is, hands down, the main reason" for centralization.[37] Beyond the amazing efficiency savings offered by leveraged spending, however, many companies are finding other motivations to centralize, including improved supply chain integration, product design and quality, manufacturing processes, supplier development, and ultimate customer satisfaction.[38] For example, to pull itself out of its downward performance spiral, Harley-Davidson (like many other companies today) discovered the key to success was "adopting beneficial relationships with suppliers and taking a strategic approach to purchasing," according to their chairman and CEO Jeff Bleustein.[39] Like many other successful CEOs today, Bleustein discovered the fundamental winning relationship between leveraged purchasing efficiency and overarching corporate effectiveness.

Air Force Contracting's Organizational Construct

The Air Force remains a more functionally oriented organization than the innovative commercial firms we studied. Hence it will probably have to expend more effort to bring relevant functions into an effective coalition for change and sustain their cooperation for the duration of the change.

—RAND

Across the wide spectrum of its operations, the Air Force depends heavily on contracted goods and services. In fiscal year 2002 (FY02), for example, the Air Force's contracts totaled roughly $69B.[40] To put that figure in perspective, based on *Purchasing* magazine's 2001 estimates, the Air Force has the nation's third largest purchase spending when compared to commercial North American corporations; only Ford Motor Company and General Motors spend more (approximately $90B and $86B, respectively).[41]

The active-duty Air Force's large contract spending is spread over 84 major installations and 82 minor facilities.[42] Collectively, this contract spending supports 9 major commands, 35 field operating agencies, 4 direct reporting units, 508,000 active duty and civilian personnel, more than 4,416 fixed-wing and rotary-wing aircraft distributed across 42 major aircraft types (many with multiple models), and dozens of individual weapon systems across a wide technological spectrum from space launch vehicles to handguns.[43]

Of the Air Force's $69B contract spend, the Air Force expends approximately $50B itself directly through organic contracting offices, while relying on other services or agencies (for example, Defense Logistics Agency and General Services Administration) for the remaining $19B in contract support (Figure 1).

Strategic Purchasing Spend Analysis

As detailed in Figure 1, contracts greater than $25K compose the majority of the Air Force's contract spending. These contracts were valued at $47.4B in FY02. (Defense Department Forms 350 are the mandatory reports for contracts valued at $25K and greater.) Contracts written for less than $25K make up a significantly smaller portion of the Air Force's spending—$515M in FY02. (DD +1057s are the summary reports for contracts valued at less than $25K each.)

Government Purchase Card Program

The Air Force's most highly decentralized spend is found within the Government Purchase Card (GPC) program. Basically, the GPC program provides credit cards to individuals within organizations across the full range of Air Force organizations for select purchases, typically below $2.5K. The vast majority of these individual cardholders are not within the Air Force's contracting squadrons or other designated purchasing organizations. Like many other commercial companies, the Air Force uses this purchase card program to streamline the procurement process for small, commercially available purchases. As noted in Figure 2, the Air Force's GPC spend was approximately $1.6B in FY02.

However, unlike most commercial companies, the Air Force's GPC program is extremely large. In FY02, the Air Force had more than 77,000 individual cardholders who, collectively, were responsible for more than 3 million purchasing transactions valued at $1.6B.[45] In fact, GPC transactions accounted for 97 percent of the Air Force's 3,246,121 contracting actions in the most recent reporting for FY03.[46] Most important, however, the GPC program is largely void of any underlying strategically sourced agreements with common suppliers and is virtually unsupported by any Internet-based procurement tools (that is, e-Procurement) to help the Air Force efficiently execute and control this largely decentralized buying methodology.

Large Contracts

Although the Air Force's GPC spend is enormous when compared to that of most companies, the Air Force spends the majority of its money via large contracts executed by its professional purchasing organizations. Looking at the contracts valued at $25K or more, in FY02 alone, the Air Force spent approximately $47B. Since nearly every major Air Force installation has at least one major purchasing office and since nearly every installation is largely responsible for its own independent base operations and support, the Air Force spreads this $47B widely across the institution in terms of decentralized sourcing. In fact, 235 uniquely identified purchasing organizations were responsible for this $47B large-contract spend in FY02.[47] As depicted in Figure 3, these many organizations collectively execute thousands of contracts with thousands of suppliers buying many different types of goods and services (as depicted by the numerous NAICS codes).

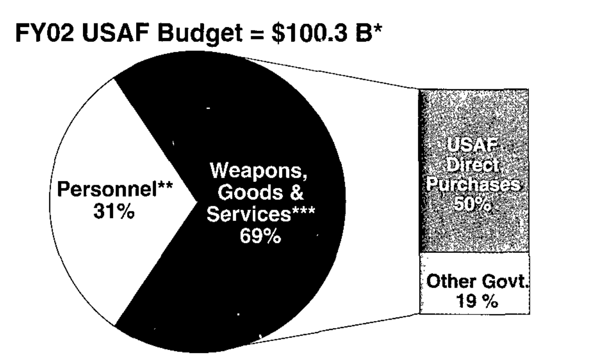
For further analysis regarding centralized versus decentralized sourcing control, it is worth noting in FY02 that the Air Force awarded 47 percent of its large contract spend and 35 percent of its large contracts via sole-source methods (that is, where only one supplier was considered for contract award).[49] Also, looking at all the new contracts awarded in FY02, 34 percent of the suppliers had multiple Air Force contracts (including one supplier with 197 different contracts Air Force-wide), and 24 percent of the suppliers did business with more than one Air Force contracting office (including one supplier who did business with 56 different offices).[50] When you further consider that larger corporations may have many different contractor identification codes within their extended organization, the picture of fragmented supplier leverage is even more readily apparent.

Commodity Fragmentation

The Air Force's purchasing construct is further illustrated by analyzing the fragmented spend patterns within individual commodity groups (Table 3).

As validated by RAND's full analysis, the supply classifications in Table 3 are virtually representative of every commodity grouping across Air Force spending. Many Air Force offices are buying similar items nonstrategically, utilizing many contracts with many contractors. The data also suggest the

Purchased Goods and Services Represent a Significant Portion of the Air Force's Budget



* USAF FY02 Statistical Digest
** $31.5B
*** DD350=$47.4B, DD1057=$.515B, GPC=$1.603B, Other Govt.~$19.3B

Figure 1. Air Force Expenditures[44]

collective value of Air Force purchases is rarely evident, as individual contracting offices have little insight into the purchasing actions of competing decentralized offices across the Air Force. Full awareness of specific commodity spend is possible only by conducting a detailed, enterprise-wide spend analysis—a capability that is severely limited in the Air Force today.[52]

Fragmented Supplier Relationships

Although the Air Force spends the majority of its money with a relatively small group of key suppliers, its organizational construct fosters fragmented relationships with these strategic suppliers. While examining this picture of decentralized supplier relationships, Richter warned Air Force leadership, "Suppliers are experts at exploiting those relationships. On the other side of the table is someone making four times as much money as you, and they earn that by exploiting differences."[53]

Richter's expert advice was for the Air Force to interface with its supply base with a single strategic policy and vocabulary. Such a strategically managed relationship is "different than a myriad of folks following the same general guidance but doing it differently."[55] Analysis of the spending data with its key suppliers (Table 3) suggests the Air Force is managing its suppliers by individual, written contracts. Unfortunately, this tactical method of managing key suppliers is a well-established *bad practice*.[56] Today's most effective purchasing organizations are finding that strategic relationships with their key suppliers yield optimal performance.

Commercial Airlift Augmentation—A Success Story

As previously mentioned, *pockets of excellence* within Air Force contracting do exist. Perhaps the greatest example of strategically leveraged purchasing is the Department of Defense (DoD) commercial airlift augmentation program, primarily executed by the Air Mobility Command (AMC). This program for procuring airlift services during both peace and war is focused strategically from beginning to end and is indeed a good example of an effective centralized procurement strategy.[57]

Beginning with the national airlift policy (last affirmed by President Ronald Reagan in 1987), the DoD institutionally is mandated to keep its organic airlift fleet minimally sized and to rely heavily on the commercial airlift fleet.[58] Reinforced by several policy prescriptions, the department only procures peacetime airlift from safe commercial air carriers that also contribute to the DoD's emergency airlift capability through fleet commitments to the Civil Reserve Air Fleet (CRAF) augmentation program.[59] Coupled with key oversight levels (for example, the Commercial Airlift Review Authority, the Commercial Airlift Review Board, and the Air Carrier Survey and Analysis Office), DoD closely manages the overarching airlift procurement strategy.[60]

When buying commercial airlift, AMC uses 5-year CRAF memorandums of understanding to outline the basic principles and to set the rules for how payment rates will be determined.[61] Then annually, AMC conducts an annual fixed buy for specific requirements and an expansion buy for anticipated but unspecific requirements. In receiving business from DoD, the carriers' entitlements for peacetime business are based on their participation in the CRAF. In effect, carriers who commit more wartime support to the CRAF are entitled to receive more peacetime business from DoD.[62]

In fact, virtually the only way to be allowed to participate in the large peacetime commercial airlift program is for carriers to participate in the emergency augmentation program. The CRAF's financial *hook* gets the carriers on board, and their compliance with mandated operational readiness and safety programs ensures their continued participation. Poor performance during fixed-buy requirements may impact a carrier's ability to participate in the expansion business. Carriers who provide consistently reliable service are entitled to receive more expansion business than poorly performing carriers.[63]

In short, the DoD commercial airlift program is very strategically focused. DoD controls virtually its entire airlift spending through a single organization, and the sourcing method is heavily dependent on the underlying value and risk of DoD's entire airlift program, from peace to war. The Air Force has rationalized its supply base strategically (only safe CRAF participants get to play) and closely manages the commodity through strategic programs built on a solid foundation of senior executive oversight and direction. The Air Force maintains impressive visibility into the program through onsite financial and safety surveys, check rides, range rides, and daily flight-following efforts.[64] The oversight is tempered with an integrated organizational construct that requires close coordination between transportation, safety, and contracting representatives with its supplier base—the carriers. As such, the commercial airlift program is a great example of the power of leveraged spending controlled by a centralized process. Unfortunately, the strategic procurement of airlift is the exception, not the rule, for Air Force purchasing.[65]

The Supply Chain Linkage

In my bible, it says that the love of hand-offs is the root of all evil!

—Michael Hammer

During the tumultuous decade of the 1990s, a multitude of complicating supply chain factors seriously strained the effectiveness and efficiency of Air Force weapon systems. In fact, from 1991 to 2000, the mission-capable rates for Air Force weapon systems declined in aggregate by 10.4 percent.[66] A significant factor of this decline includes the aging health of the Air Force's fleet.[67] In FY01, the average age of its weapon systems was 22.2 years. As a result, reliability and part obsolescence issues became major readiness drivers. Further complicating the support of its aging aircraft and systems, the budget reductions of the 1990s and internal funding priorities led the Air Force to fund only 82 percent of its self-computed spare parts requirement.[68]

Not surprisingly, the Air Force's total not mission capability supply rates increased by 5.6 percent alone during the decade. Aggressive inventory reductions executed by the Air Force also influenced this rate increase, since during the 1990s the Air Force cut its inventory of spare parts by 64 percent.[69] Unfortunately, the Air Force did not target its reductions scientifically, in many cases simply truncating complex algorithms for spares calculations, across the board with little regard for optimizing effects.[70] Coupled with the major organizational and process changes during the decade (including the objective wing structure reorganization, the Base Realignment and Closure depot shutdowns, the transition from three-level maintenance to

two-level maintenance, the transfer of consumable spares management to the Defense Logistics Agency, and radical changes in the customer pricing structure for spares sustainment), the Air Force placed a great strain on its supply chains in a relatively short amount of time.[71] Unfortunately, most of these radical adjustments were aimed at efficiency—not effectiveness—as demonstrated by the 10-point drop in Air Force mission-capable rates during the 1990s.

Personnel reductions and retention problems certainly impacted weapon system readiness, too. During the decade, manning within the midlevel aircraft maintenance community dropped from 103 percent to 74 percent.[72] Beyond the readily apparent implications of reduced experience of the Air Force's skilled maintenance technicians, the second- and third-level effects are certainly notable. As lesser experienced personnel without adequate supervision increased their role in the supply chain, they likely decreased the quality of the maintenance decisions on the flight line and in the maintenance back shops. If this lack of experience contributed to wrongly diagnosed problems and incorrectly executed solutions, their increased role would have exasperated the waste potential within an already amazingly inefficient supply chain network.

The Spares Campaign

In light of this disconcerting readiness picture, the Air Force Chief of Staff endorsed a review of spares management processes in early 2001.[73] Following significant study and analysis, the Air Force narrowed its improvement efforts to eight overarching supply chain initiatives, and at the 2001 Fall Corona meeting, the Air Force's senior leadership overwhelmingly endorsed the eight initiatives of the Spares Campaign.[74] As supported by the analysis leading up to this decision, they advocated the need for radical change to transform the Air Force's fragmented sustainment processes. Specifically, the Spares Campaign's Supplier Relationships Team identified six underlying SCM issues primarily responsible for fragmenting the Air Force's sustainment process, as summarized in Table 5. As is readily apparent, each of these issues is linked intrinsically to the purchasing process.

FY02 New Contracts Valued at More Than $25K

- $47B in Purchases
- 235 Different Purchase Office Codes
- 21,093 Different Contracts
- 10,130 Different Contractor Identification Codes
- 731 Different NAICS* Codes

*North American Industry Classification System
Source: FY02 Air Force DD 350 data

Table 2. High-Level Spend Analysis (Large Contracts)[48]

FY02 Centralized Spend with Key Suppliers						
Firms	# Contracts	# Contracts Sole Source	$(M)	% $s Sole Source	# Contractor ID #s*	# Purchasing Office Codes
Lockheed Martin	319	61	10,230	69	60	91
Boeing	286	59	8,762	34	39	84
Northrop Grumman	369	60	2,215	68	67	126
Raytheon	251	60	2,115	63	46	78
UTC	233	67	1,707	77	29	32
TRW	66	30	1,230	7	23	51
L-3 Comm Holding	98	55	871	82	25	44
North American Airlines	1	0	622	0	1	1
General Dynamics	112	49	529	25	24	63
Dyna Corp	23	4	510	0	0	21
*A moving target because of ongoing acquisitions, sales, and mergers						

Table 4. Air Force Key Supplier Management[54]

Federal Supply Class	# Purchase Office Codes	Total # Contracts	# Contracts	Total $s (Millions)
Office Furniture	91	407	258	$95
Radio and TV Communications Equipment	79	142	92	$114
Custodial—Janitorial Services	79	219	165	$151
Misc Communications Equipment	77	246	184	$255
ADPE System Configuration	76	246	184	$255
Trash/Garbage Collection Services	74	136	100	$61
Maintenance—Office Buildings	74	392	306	$196
Maintenance—Other Miscellaneous Buildings	72	487	352	$242
Maintenance—Other Administrative and Service Buildings	69	301	228	$102
ADP Software	68	298	255	$210

Table 3. Air Force's Fragmented Spend Pattern[51]

Purchasing and SCM Initiative

One of the most overarching supply chain initiatives within the Spares Campaign was the plan to adopt improved Purchasing and Supply Chain Management (PSCM) tenets across the Air Force's sustainment programs. The vision of this initiative was to increase weapon system performance and reduce total ownership costs by strategically integrating materiel management functions throughout weapon system supply chains.[76] From this vision statement, it is clear the Air Force was directing the PSCM effort at both effectiveness and efficiency. The Pentagon focused the PSCM initiative on moving the Air Force beyond its unmanaged, crisis-driven, adversarial, and cost-only business approach to a more strategically aligned, long-term, integrated, and collaborative partnership with its contractors. A key goal was to move the Air Force beyond its transaction-focused, data-limited, and poor analytical capability to a real-time, highly visible, interconnected, and flexible information capability across its extended supply chains from customers to suppliers.[77]

In terms of forecasting and demand planning, PSCM targeted the Air Force's informal *gut feel* requirements cycle by advocating for increased integration of key customers and suppliers into a more effective, cross-functional planning process.[78] But above all, the PSCM initiative was focused on creating a more strategic approach to the complicated business of weapon system sustainment. Such a strategic approach to an institution-wide process naturally implies the concept of a *top down directed activity* or increased centralized control.[79] The fundamental tenets listed in Table 6 demonstrate the end-state objectives of the PSCM initiative.

The Need for Strategic Focus

In fact, to address all six of the Air Force's underlying supply chain issues properly, PSCM advocated for a fundamental increase in the level of centralized control of the purchasing process, as demonstrated by the initiative's consistent *strategic* focus.[81] Although the correct level of centralized control likely will remain a contentious subject between various individuals at headquarters and operational units throughout the Air Force's sustainment network, the consensus remains that fundamental change is required.[82]

Within the Air Force Materiel Command (AFMC), the Air Force's primary organization responsible for weapon systems sustainment, only 4.4 percent of its 20,000 active spare parts and only 18 percent of its entire spares spending have been placed on any of its 12 strategically sourced contracts. Not surprisingly, the average cycle time for buying parts within this tactically oriented process at AFMC is 660 days, which equates into a pipeline inventory sink of $1.4B. Admittedly, AFMC has $6.8B in excess inventory, which by itself creates another annual bill of $60M for transportation, storage, and transaction costs.[83]

Perhaps most directly reflective of the linkage between poor supply chain performance and the purchasing process (read operational effectiveness), up to 28 percent of AFMC's initial requests to its purchasing organizations arrive already inside the necessary production lead times.[84] In other words, by the time the Air Force realizes it needs a part, it is too late to request, make, and receive the part on time. Further exasperating the issue, once it does receive a contract, suppliers (including organic Air Force sources of supply) "are not measured or treated as strategic partners."[85] Perhaps unfortunately affirming this section's opening quotation on hand-offs being the *root of all evil*, AFMC has no less than 199 different information technology system interfaces to manage this poorly integrated end-to-end process across customers, functional stovepipes, and suppliers.[86] More change still is required.

Increased Control of Air Force Purchasing

We trained hard, but it seemed that every time we were beginning to form up into teams, we would be reorganized. I was to learn later in life that we tend to meet any new situation by reorganizing—and a wonderful method it can be for creating the illusion of progress while producing confusion, inefficiency, and demoralization.

—Petronius Arbiter, Circa 210 BC

The evidence is very straightforward and concludes the Air Force purchasing construct is highly decentralized, both in terms of control and supply chain execution. The advice of industry's leading procurement experts, the lessons of successful commercial organizations, and internal fragmented spending and supply chain patterns collectively point toward the potential benefit of change within the Air Force's decentralized purchasing construct. Certainly, the preponderance of evidence suggests that

Underlying Supply Chain Issues
• A functional, stovepiped, and organizational focus is inhibiting weapon system sustainment.
• No one entity is responsible for managing the supply base and supplier relationships.
• Demand planning and replenishment actions are largely tactical rather than strategic.
• Visibility is poor among active participants in the supply chain.
• Supply chain incentives are not aligned with strategic goals.
• Supply chain management education and training levels are low.

Table 5. The Air Force's Fragmented Sustainment Problem[75]

Synergetic Tents of PSM
• Purchasing and supply metrics aligned with operational goals
• Comprehensive knowledge of where the money is spent
• Full awareness and understanding of the supply chain
• Sourcing strategies tailored to operational value and risk
• Actively managed supply base
• Optimized supply base
• Strategic sourcing vice tactical actions
• Key suppliers managed strategically
• Linked demand and replenishment planning
• Comprehensive supply chain visibility
• Supply chain aligned for optimal efficiency
• Integrated organizational constructs
• Strategically focused workforce
• Continuous improvement

Table 6. PSCM End-State Tenets[80]

a move toward increased strategic control of its large purchasing machine likely will make the Air Force more efficient and effective.

Historically, the Air Force has focused the majority of its procurement improvement efforts on major acquisition systems and technology programs.[87] After all, these programs account for approximately 27 percent of the Air Force's budget and warrant such focus. Further, these weapon system programs are the big ticket and shiny new initiatives that politicians and other leadership naturally focus on. However, as even experienced acquisition personnel are often unaware, operational and sustainment spending accounts for the lion's share—more than 42 percent—of the Air Force's budget.[88] Within this highly decentralized spending category, the Air Force could make substantial improvements in efficiency and effectiveness by taking a more strategic approach.

But, are the benefits of change really worth the effort? Will the Air Force (arguably, an already suffering victim of repetitive change syndrome) actually be able to make meaningful institutional change toward centralized purchasing given its business and operational slant toward decentralization? The obvious answer is, "It depends." Beyond the barrier of moving past a decentralized mindset, the Air Force will struggle greatly in overcoming the related symptoms of "initiative overload, change-related chaos, and employee anxiety, cynicism, and burnout," if the premise of repetitive change syndrome is accurate.[89] The strategic benefits of transformation must outweigh the tactical cost of change, and the results must be tangible—not just an illusionary cloud of dust stirred up by the activity itself.

Certainly, the estimated monetary savings present a powerful argument for change. Although industry's leading procurement executives who have analyzed the Air Force's procurement process collectively argue the Air Force has *above average* waste within its heavily decentralized purchasing construct, an average industry savings target of 12 percent across operational and sustainment spending would bring more than $5B back to the table for the Air Force's executive leadership. Even those doubtful of purchasing's impact on supply chain effectiveness can understand how a relative increase of $5B could translate into increased warfighting effectiveness for the Air Force. After all, $5B is grossly equivalent to 48 additional F/A-22 Raptor aircraft, 127 joint strike fighters, or 25 C-17 Globemaster IIIs. Not to mention, $5B is approximately the entire Air Force's spares budget and is greater than the gross domestic product of 68 nations.[90]

Skeptics of achieving that level of success enterprise wide should remember, however, a 12-percent savings in *any* of the Air Force's many commodity groupings would be significant, as highlighted in Table 6. Meaningful change toward increased strategic control of even a few targeted commodity groupings could have a wide-ranging impact on Air Force operations.

Recommendations for Air Force Procurement

As demonstrated by many large successful organizations, a move toward centralized procurement is fundamentally critical to the success of the Air Force's operational supply chain, both in terms of efficiency and effectiveness. The harder part of this assertion, however, is the methodology: how can the Air Force replicate commercial success to achieve these operational goals? Given the large and bureaucratic nature of its organization, a systematic reengineering of the Air Force's embedded supply chain processes promises to be too slow and cumbersome for meaningful change within an institution always *on call* for national defense. Destroying an old culture and creating a new one "is typically very slow—spanning years not weeks, requiring iron-willed persistence by the firm's leadership, and fraught with overt and covert countercultural resistance, often leading to backlashes that drive the firm to return to its old culture."[92] A better path toward meaningful change for Air Force readiness would minimize destruction and disruption by using existing assets and "recombining them creatively in a new and successful fashion."[93] There is no doubt that the Air Force's transformation efforts must transcend beyond the illusion of reorganization, as alluded to by this section's opening quotation.

The Commodity Council Methodology[94]

Following Eric Abrahamson's concept of *creative recombination* and veering away from the more destructive tendencies of today's more popular reengineering techniques, the Air Force can enact the needed change by adopting industry's *commodity council* methodology. *Commodity council* is a term used to describe a cross-functional sourcing group charged with formulating a centralized purchasing strategy and establishing centralized contracts for enterprise-wide requirements for a specific category of goods or services. Following the council's strategic sourcing actions, decentralized units then execute tactical ordering against those preestablished business agreements. The commodity council concept is predicated upon maximizing the cost-reduction advantages of leveraging enterprise-level spend, using market experts to formulate sourcing strategy, and forming strong relationships with preferred suppliers.

Perhaps against common perceptions, commodity councils have proven effective in improving customer support, increasing the quality of goods and services, and accelerating delivery responsiveness, in addition to reducing the purchase cost of commodities. By eliminating duplication of effort across the organization, minimizing supply chain costs through integration and collaboration, and leveraging the power of consolidated purchasing across the enterprise, commodity councils are able to bring both efficiency and effectiveness benefits to the organization.

The key to the commodity council approach is relying on market experts in the specific commodity that is being purchased to make well-informed, market-savvy sourcing decisions that fully meet all enterprise-wide requirements for a specific commodity. Typically, these commodity experts are from within the organization's decentralized units. In this manner, the decentralized units play an integral role in developing the commodity strategy they will later execute. This concept ensures an approach that maximizes the benefits of centralized management while retaining the flexibility and operational risk mitigation of decentralized execution.

The objective of a commodity council is to identify crucial commodities for centralized management. This process includes gathering market intelligence, developing a written sourcing strategy, and selecting suppliers based on that criterion. Individuals with an intimate knowledge of particular commodity groupings should chair the councils and appoint cross-functional representatives to their teams to ensure full-spectrum

Air Force Sustainment/Operational Spend = $42B Annually
• If Air Force meets industry's 12% average goal, Air Force can save $5.04B.
• $5.04B = 48 F-22 Raptors
= 127 Joint Strike Fighters
= 25 C-17 Globemaster IIIs
> Air Force Spares budget
> GDPs of 68 nations
When does it become meaningful?
• 12% savings in office furniture = $11.4M
• 12% savings in IT commodities = $710M
• 12$ savings in trash collection = $6.1M
Leveraged centralized purchasing power promises increased efficiency and effectiveness.

Table 7. The Potential Impact of Leveraged Centralized Purchasing Power[91]

Commodity Council = Cross-Functional Sourcing Team
• Develops enterprise-wide procurement strategies.
• Integrates customers and suppliers.
• Drives commonality and standardization.
• Leverages purchasing volume.
Characteristics of a Commodity council
• Executive-level endorsement.
• Well-informed and market-savvy commodity experts.
• Centralized strategy—decentralized execution.
• Eliminates duplication of effort.
• Minimizes supply chain costs through integration and collaboration.
• Demonstrates the power of leveraged purchasing.

Table 8. Commodity Council Fundamentals[95]

representation from across the enterprise. To ensure councils develop appropriate strategies, chosen members of the council must be experts within that particular commodity area.

Beyond the council level, the Air Force should designate a single purchasing executive to approve sourcing strategies developed by the council. This ensures a single point of responsibility and retains the appropriate acquisition authority. This executive is responsible for providing an Air Force-wide strategy for purchasing a specific commodity grouping and for ensuring decentralized units execute according to the approved strategy. The sourcing executive is accountable for ensuring the council creates and maintains appropriate supplier relationships; integrates suppliers into supply chain operations; drives commonality and standardization of requirements; leverages commodity volume across the enterprise; reduces supply chain costs; develops commodity guidelines, strategies, and scorecards; complies with all legal requirements; and determines the appropriate level of decentralized effort.

The council is responsible for developing strategies that include the number of suppliers and amount of effort awarded to each supplier; a list of required local and global suppliers; supplier development plans; supplier relationship methodology (for example, traditional and strategic alliance); contract type and length; and incorporation of socioeconomic programs. Executives should evaluate the performance of individual councils by calculating how many requirements were successfully anticipated with preestablished business arrangements and by evaluating the performance of the commodity council's selected suppliers (that is, *you are only as good as the supplier you select*).

Conclusion

Meaningful institutional change toward centralized purchasing fundamentally can improve the Air Force's effectiveness and efficiency. Using the commercial best practice of *commodity councils*, Air Force contracting has the opportunity to transition to a construct of strategic leverage quickly while minimizing the negative impact of radical change upon overarching Air Force operations. Within today's contracting structure, the basic hierarchy already exists, which could support this recombination of people, networks, culture, processes, and structure. The senior contracting representatives within the Air Force's headquarters and major command structures could transition easily to more strategic roles if the Air Force focused the appropriate level of attention on this issue. Air Force contracting has to move beyond tactical sourcing and compliance-oriented oversight, and contracting personnel have to get in front of user's requirements and be prepared to respond to customer requirements via a quick, seamless, and transparent methodology. Immediate further study is warranted in this regard.

Creating a commodity council approach within the Air Force seems to be the best way to reach these purchasing objectives. Implementation promises to decrease the unit cost of purchases, decrease lead times, and increase Air Force purchasing flexibility. For the Air Force to become a best-in-class purchasing organization, implementation of a commodity council is imperative. Commercial best practices in purchasing have transformed to a commodity council approach in recent years, and the improvements realized have been nothing short of spectacular. Implementation of a commodity council-based purchasing strategy is imperative to the efficiency and effectiveness of the Air Force. Today, more than ever, the Air Force cannot afford to delay.

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Special Feature

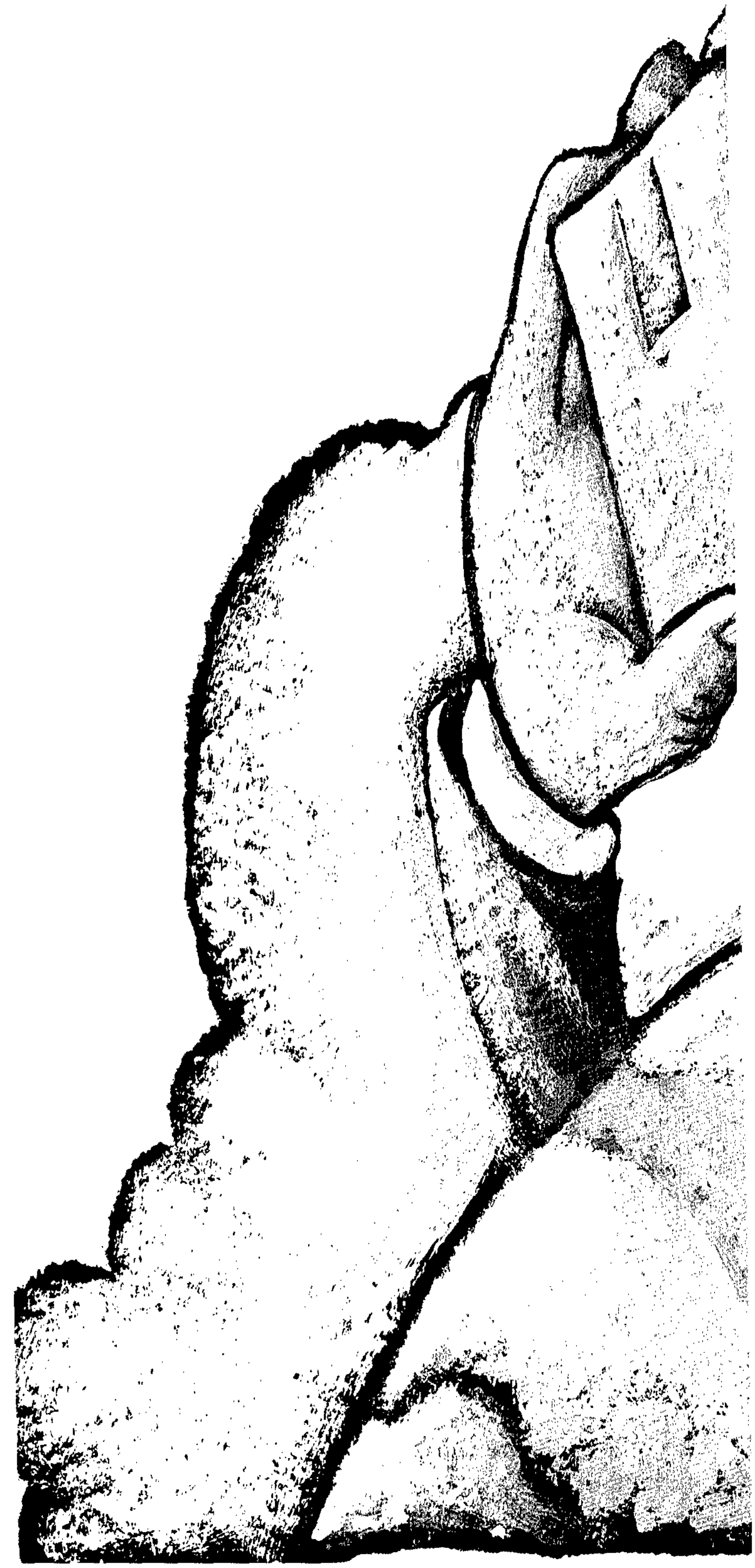
Introduction

If you are short of everything but the enemy, you are in the combat zone.

—**Anonymous**

Logistics leaders are charged with organizing, training, and equipping units under their command. Of these three duties, *organizing* is the only one without a recurring price tag. Training and equipping are, by definition, a cost-dependent activity. There is no great secret to securing funding, merely the investment of time and analysis to capture what logistics requirements (combat capability) support peacetime training, wartime deployment, prosecution of targets, and redeployment of forces. Clear, concise justifications need to be written to restate those requirements in *budgeting* language. This justification conveys how to quantify logistics requirements, evaluate levels of mission supportability, report mission capability, and compete more effectively for scarce non-noncost-per-flying hour funding resources at the squadron and group level.

Quantifying logistics requirements is the key to raising the pursuit of funding from the *gray zone* to a meaningful discussion of capability. Too often, base-level fund review boards roll critical repair, replacement, or new construction of logistics facilities into head-to-head competitions with services, security forces, and communications objectives without objective data on combat capability. Likewise, elements of capability already identified in maintenance units typically are rolled up into flying squadrons' Status of Resources and Training System (SORTS) reports, subjecting their combat status to watering down shortfall impacts on combat capability. These are the product of information voids affecting funding decisions. It falls on the maintenance group and subordinate squadrons to identify what the unit's mission is, what requirements support the mission, and how the existing shortfalls impact the mission. These data must be packaged in the form that wing, numbered air force, and major command (MAJCOM) leadership recognizes as significant: mission capability. The current discussion needs to change from "how much money do you (maintenance group) want" to "what capability can you (wing commander) afford." For wartime taskings, the conversation needs to follow a structure of goals and cost: if the SORTS readiness goal is *full wartime mission* capable (C-1),[1] the price is $$$$; if the readiness goal is many, but not all, *portions of the wartime mission* (C-3),[2] then the price is $$ and so on. The effect is electrifying when reflecting on the age-old question, "What happens if I cut your funding 10 percent," and the reply is in terms of capability, not some subjective discourse on workarounds.



Funding Support
Capabilities-Based Programming

Major Dane P. Wes
Major Douglas W. Pohlman,

Can a method be developed to assist squadron and group logistics commanders to secure required mission funding? The answer lies in taking a *general to specific* approach, starting with an understanding of *budget language* as a first step.[4] As seen in Figure 1, the sample program objective memorandum (POM) summary slide lists approved funding levels, proposed budget amendments, and the associated revised totals out to fiscal year (FY) 2011 for a particular change control number action. The slide also identifies any supporting equipment purchases and adjustments in manning authorizations. In this sample RAPIDS slide, the proposed action is to plus-up FY10 and FY11 $50.8M and $51.3M respectively with a purchase of two additional engines in the same year groups.[5]

Within the RAPIDS are additional slides that identify program element codes targeted for modification. The slides detail the affected appropriations and cost codes for just the future years' defense programs (FYDP) (Figure 2).[6]

Both Figures 1 and 2 represent the method by which the Air Force decides which program will receive funding in the outyears. The program element code used in this sample impacts the F-16 fighter program (PEC 27133F) with proposed funding changes in the Advance Missile Procurement (cost code 20021), Munitions and Associated Equipment (cost code 81000), Depot-Level Repair (cost code 64560), and Aircraft Purchase (cost code 10001) programs. However, *why* this program was funded over others cannot be identified. That is the dilemma.[7] The day-to-day concerns at the group and squadron level can be lost in the funding process. Units' individual shortfalls and their impacts simply are not described at this high level. To succeed in securing funds, logistics requirements must be translated into language meaningful to the budget leadership.

The key to translating requirements into effective budget requests is the Resource Allocation Model (RAM).[8] RAM can be used at the MAJCOM level as a means of collecting wing, numbered air force, and staff inputs; sorting and establishing the priorities; and then deciding which shortfalls are funded from the limited MAJCOM budget. The RAM process is built on a fundamental value of capability. As seen in Figure 3, capability is described in a range less than or equal to 0.7 and up to a value of 1.1.[9]

Unclassified

FY06 POM Baseline Ext

BACKGROUND:

(U) The purpose of the FY06 POM Round 1 Baseline Extension is to extend all approved AF programs in the F&FP ABIDES Database for FY10 and FY11 using the current approved inflation factors.

ADJUSTMENT:

(U) The FY06 POM Baseline Extension, Rd 1, will extend approved programs through FY10 and FY11. All ZBTs, disconnects, initiatives, and offsets will be addressed in Round 2.

$M:06R1T101AN	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11
CURRENT PRG	50.0	50.0	50.0	50.0	50.0	50.0	0.0	0.0
ADJUSTMENT			0.0	0.0	0.0	0.0	50.8	51.3
REV PGM TOTAL			50.0	50.0	50.0	50.0	50.8	51.3

PROCUREMENT	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11
Engines	0	0	0	0	0	0	2	2

MPWR	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11
OFF	0	0	0	0	0	0	0	0
ENL	0	0	0	0	0	0	0	0
CIV	0	0	0	0	0	0	0	0

IMPACTS:

(U) - All requirements for baseline extension will be presented to the AFG, but only programs greater than $100M annually will be briefed

(U) - Panels are responsible for extending all investment appns (3010, 3011, 3020, 3080, and 3600, except cost-categories 39*** and 595**) and new mission MILCON. All other MILCON will be extended by ILEP.

(U) - FMB will extend O&M, Appn 02 Buy Quantity, inflate all O&M based on MDS/PDS DB and include it in the FY06 POM Baseline for Rd 1 start position

(U) - Panels will be required to submit a separate RAPIDS CCN to change O&M, coordinate change with PDS/MDS DB POCs and brief to the AFG for approval

Unclassified

Page 1 of 1

Figure 1. POM Change Control Number

Unclassified

06R1T101AN **FY06 POM Baseline Ext**

ADJUSTMENT: (U) The FY06 POM Baseline Extension, Rd 1, will extend approved programs through FY10 and FY11. All ZBTs, disconnects, initiatives, and offsets will be addressed in Round 2.

Funding Lines Total					$0.000	$0.000	$0.000	$0.000	$50.800	$51.300
PE APPN	COST	PROG	OAC	WSC/BPAC	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011
27133f3020	20021	aq1000	78	000000	0.000	0.000	0.000	0.000	15.200	15.400
27133f3080	81000	aq1000	78	000000	0.000	0.000	0.000	0.000	14.000	14.100
27133f3600	64560	aq1000	78	000000	0.000	0.000	0.000	0.000	9.000	9.100
27133f3010	10001	aq1000	78	000000	0.000	0.000	0.000	0.000	12.600	12.700

	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011
Procurement								
Engines	0	0	0	0	0	0	2	2

Coordination

Panel Chair:
Panel POC:
CONOP Champion:
Crosscut Panel:
IPT Chief:
ANG/AFR:

Program Element Mtr:
3080 FM Appn Manager
3600 FM Appn Manager
3010 FM Apn Manager
3080 ILPY Manager

XPPE DB Manager:
ZBT Manager:

1/5/042004 Unclassified Page 1

Figure 2. PEC Summary Slide

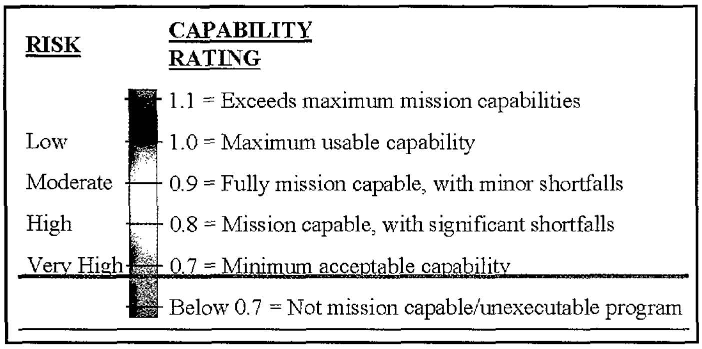


Figure 3. RAM Capability Definitions

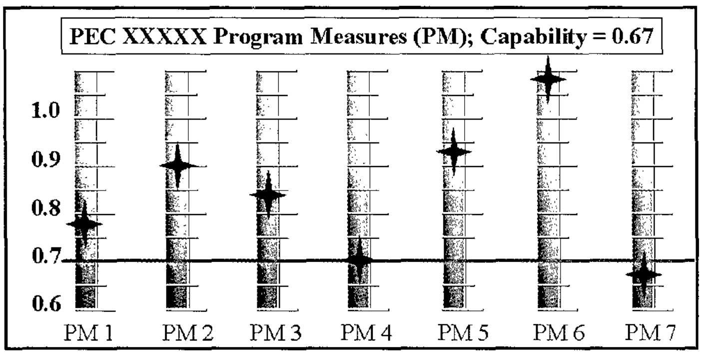


Figure 4. PMs Supporting the PEC

Each measurement of capability is then applied to the item of interest. At the MAJCOM level, this building block is organized around the program element code. As seen in Figure 4, the program element code is broken down into the main funding elements resident within the PEC's scope, and the representative performance measures (PM) are combined to determine the overall health of the program element code. Performance measures are key measures that capture contributing capabilities within a program element code and provide clear visibility as to where funding can impact a PEC's capability. In a car, for instance, the performance measures could be the drive train, suspension, fuel system, electronic system, hydraulic system, body, and interior. The weight of each performance measure would be determined by its contribution to the overall capability of the program element code, independent of the financial value. For instance, in the car example, the weight of the drive train would exceed the weight of the interior relative to the car's capability. In Figure 4, there are seven different program managers who are contributing to the capability of the program element code, but as in the case of the car, the overall capability of 0.67 for the program element code is based on its characteristics. There are cases where a PEC's capability might be determined by averaging PM capabilities, but the impact of funding tends to be less clear than a weighted approach.[10] In this case, the majority of performance measures are 0.7 or greater; however, PM 7 is so critical to the program that the program element code is valued as not mission capable.

In the next step, the overall impact of each performance measure to the program element code is determined and displayed in the form of financial impact (Figure 5). In this example, the current budget buys an overall capability of 0.67, and if PM 7 is increased by $1.2K, then the capability rises to 0.7. The program element monitor (PEM) has responsibility for managing the program

Article Highlights

Logistics leaders are charged with the duty to organize, train and equip the units under their command.

Squadrons and groups must invest time and thought to compete effectively for funding resources at the MAJCOM, Air Force, and DoD levels. In other words, they spend the time to determine the requirements necessary to support the peacetime and wartime missions, as well as the thought in applying the financial resources in a traceable manner. The key is to establish the fundamental requirements supporting the peacetime and wartime missions. When established, the requirements clarify not only the shortfalls identified from the logistics perspective but also mission impact to senior leadership. Once leadership understands the implications to the mission, more effective prioritization of resources through the unit is achieved more easily.

element code and will attempt first to reflow funds within the program element code to raise all performance measures to 0.7 (minimum acceptable capability to perform the function or mission). Using Figure 5, the reflow could pull $225K from PM 1, $75K from PM 2, $300K from PM 3, $25K from PM 5, and $175K from PM 6 for a total of $800K to flow to PM 7, while lowering the *donating* performance measures to a capability level of 0.7 (minimum acceptable). In this case, however, PM 7 still needs $400K to achieve the minimum 0.7 capability. Given the capability shortfall, the program element monitor will need to compete for additional funds within the MAJCOM's budget decision process to fill the requirement.[11]

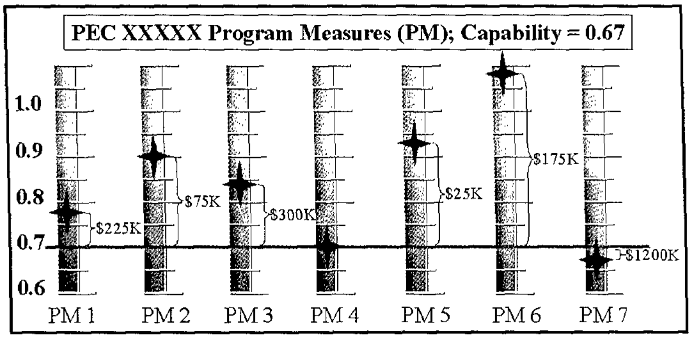


Figure 5. PM Budget Margins and Overall Capability

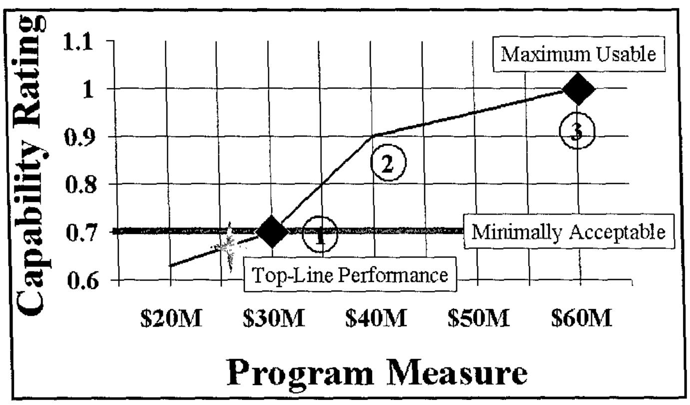


Figure 6. PEC Performance Value

When the program element monitor presents the request to the MAJCOM for additional funding, the MAJCOM leadership needs more information from the RAM process to determine the best budgeting course of action. Specifically, leadership needs to understand what needs to be funded, when the funding should be available, and where the funding should be applied to get the best performance value. To answer these questions, the RAM process uses *performance value* as a means of communicating the price of capability. Figure 6 quantifies the performance value of the program through key variables.[12] *Top Line Performance* (the star) is the value of the current funding level of $25.6M and its relative capability. *Minimally Acceptable* identifies the minimum amount of funding required to achieve 0.7 capability ($30M), and a fully capable program is achieved at *Maximum Usable* or $60M. Breakpoints (1, 2, 3) represent funding opportunities (possibly equipment purchases, building updates, and so on), clearly identifying the capability purchased with each increment of funding. Performance value captures the impact of funding for a single fiscal year, so six performance value charts are required to represent the program's performance in the RAM over the FYDP.

The RAM process provides key attributes that MAJCOMs can rely on for well-informed financial decisions.[13] RAM provides

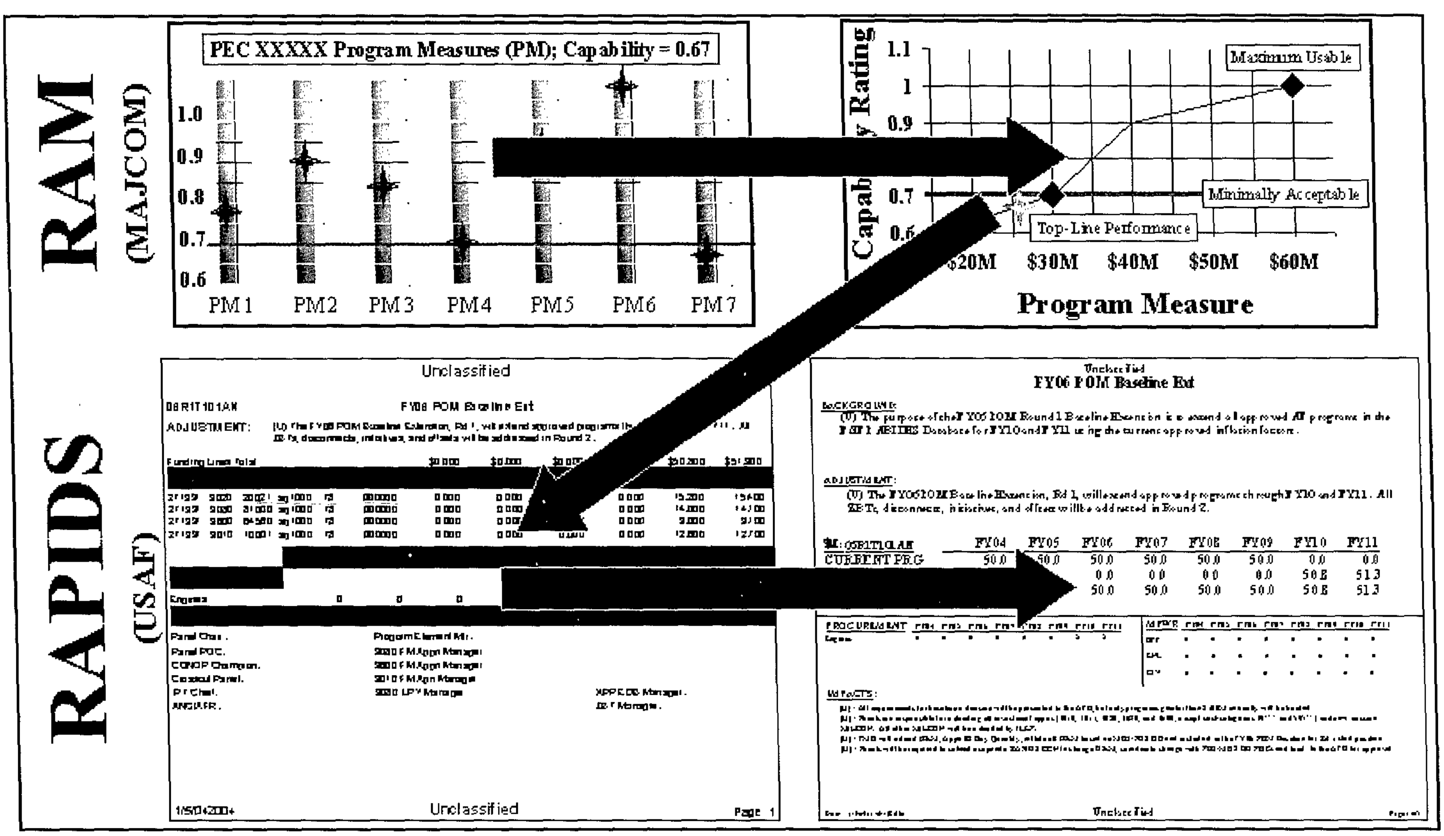


Figure 7. RAM-RAPIDS Submissions Process

MAJCOM budget leadership answers to critical questions based on the PEC's value to the MAJCOM mission, PEC viability, PM support to the program element code, and required cost to fill the shortfall. The desired outcome is a MAJCOM decision to reflow funds within its own budget to meet the need. If the means to fund the shortfall exceed the MAJCOM's budget, then the request goes to Air Force-level as an unfunded requirement.

The keen environment for competing for limited funds is common to both Air Force and MAJCOM levels. The Air Force has a set budget to meet its assigned tasks. Subsequently, the budgets provided to the MAJCOMs are likewise limited. Lead commands (Air Combat Command [ACC] and Air Mobility Command) tend to receive the majority of funding (and bills) while operational commands (United States Air Forces in Europe [USAFE], Pacific Air Forces, and so on) are more limited. Effectively competing for these scarce funds requires objective arguments establishing who needs the funding; what is needed; why it is important to the mission; where the capability will be used; and finally, when the funds are required? The logic summary using both RAM and RAPIDS capturing these arguments and translating them into budgeting language is illustrated in Figure 7. Therefore, capturing the capability of performance measures; combining performance measures to identify PEC viability; detailing the support funding across the FYDP; and finally, proposing a budget change through the RAPIDS process completes the submission.

The opportunity for wings to submit funding shortfall requests is part of the annual budget request process. It is critical for groups (and sometimes squadrons) to establish an open dialog with the MAJCOM program element monitor responsible for managing the affected program element code throughout the year. Effective PEC management begins when the program element monitor understands what the "PEC does for [the MAJCOM] and for the combat air forces."[14] The exact timing for this process varies by MAJCOM, but a sample schedule is provided in Table 1.[15] The cycle is dependent on Air Force funding schedules, but typically, the MAJCOMs will conduct their *PEM Parade* in the November timeframe. This is the first level of competition for funds at the MAJCOM and the acid test for the affected PEC's capability argument. MAJCOMs collect available information on the program element codes; then process all budget requests through the remainder of the process; and finally, translate the budget decisions into RAPIDS slides for submission to the Air Force-level process.[16]

Developing Logistics Requirements

Two categories of logistics requirements were considered when researching for this article: wartime and peacetime. Wartime requirements include capabilities necessary to deploy, prosecute the conflict (conduct hostile operations), and redeploy or reconstitute. Peacetime requirements are focused on training the rated and nonrated force by providing enough mission-capable aircraft, equipment, and support structure to meet the ready aircrew program[18] requirements and produce a qualified maintenance workforce. Financial support justification for both categories can come through three different requirements processes: local flying programs, SORTS, and the Aerospace Expeditionary Force (AEF) Unit Type Code (UTC) Reporting Tool (ART).

DATE	ACTION	REMARKS
Sep	POM Kickoff Chaired By MAJCOM Directorate	
Sep	Brief MAJCOM/CC on POM Strategy to Obtain Guidance	
Nov	MAJCOM Dir. Brief Programs to Lead/Other Directorates	PEM Parade (Part I)
Dec	MAJCOM Dir Brief Budget Programs to MAJCOM/CC	PEM Parade (Part II)
Jan	MAJCOM Lead Briefs CSAF and Other MAJCOMs	
Jan	MAJCOM Lead Briefs Air Force Board	
Feb	Air Force Panels Analyze and Integrate MAJCOM Submissions	
Mar	Air Force Board POM Review	
Apr	Air Force Council POM Review	
May	Air Force Delivers POM to OSD	

Table 1. MAJCOM Abridged POM Time Line[17]

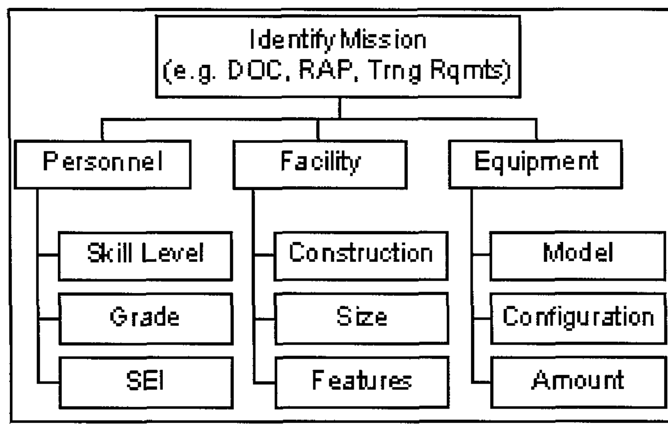


Figure 8. Simplified Requirements Derivation

The process for deriving fundable logistics requirements is illustrated in Figure 8—there is nothing new needed to determine requirements in terms of organization or personnel. Leadership needs to establish a goal for performing the analysis using the maintenance group analysis section in quantifying logistics requirements. The fundamental approach is to establish requirements agreed upon by both the operations group and maintenance group leadership and then have the requirements approved by the wing commander. Once established, these requirements serve as the basis by which capability is measured.

Peacetime Training Requirements

Establishing peacetime training requirements suitable for determining the capability of the group or squadron is driven by the flying and personnel training program. Training in this case is defined as day-to-day flying and related maintenance support required to meet the ready aircrew program and maintenance training[19] programs. Given the variances in primary aircraft assigned (PAA) across the different mission design series aircraft and wings, settling on a standard mission capability (MC) rate as a common basis for discussion, is the most desirable approach.

Evaluating the level of training capability contributed by or subtracted from the required MC rate is a function of *not mission capable* (NMC) levels. For instance, standardized levels for NMC maintenance, not mission capable-supply, and not mission capable-both (NMCB) are set values within each MAJCOM,[20] and exceeding those values impacts the scheduled flying-hour program that supports the training mission. As a matter of logistics purview, the discussion centers on NMC and NMCB. As seen in Figure 9, a sample 24-PAA squadron has standardized the number of aircraft available for the flying schedule (18) and the number set aside for maintenance activities. As in this example, the maintenance activities may include aircraft set aside for programmed depot maintenance (one), wash (one), paint (one), phase (one), cannibalized aircraft (one), and weapons load training (one). A violation of this standard is depicted as the cross-hatched area starting in February, with a variable pattern extending through June where too many aircraft are inducted into maintenance and not enough are available for the flying schedule.

Translating these violations to a RAM-capability scale requires an objective selection of criteria to consider and establish what capability the maintenance unit is providing to the flying unit. The sample criteria in Table 2 categorize very simple logistics-related violation criteria into subject-matter areas. These are weighted in terms of their immediate or long-term effect on aircraft availability for application to the capability definition scale (Figure 10). Further refinement of these criteria allows for selecting specific work unit codes out of each area and assists in assigning various capability impact values for more realistic capability measurement. For the purposes of this article, greater levels of detail fall to the reader for further exploration.

Once senior leadership agrees to the capabilities list and assigned weights, the next step entails breaking down capability to squadron, shop, and section levels. Examining the equipment maintenance squadron (EMS) may reveal critical capability failure points as illustrated in Figure 11. In this case, the fabrication flight has a capability shortfall (Figure 12), within which the aircraft structural maintenance section shows the corrosion control function (or performance measure) as the driver (Figure 13). The causes could be a paint barn in need of upgrades (military construction funding), an environmental compliance assessment and management program equipment shortfall (operation and maintenance [O&M] funding), or a shortage of computer printers (O&M funding). Budget increases are then sought for application at this level of resolution to ensure mission capability.

Peeling the capability levels back to this level does four key things for the funding decision process. First, the fundamental cause of significant drops in capability is identified down to an actionable level. Second, based on its impact, the shortfall can be assigned an objective priority in the funding decision process. Third, the method used to identify the shortfall fits precisely into the RAM budget management methodology. Finally, filling the shortfall is fully retraceable. This means the money allocated to the effort can be traced readily in terms of its effects. An objective analysis of the shortfall example reveals the best points to apply funding and the impact to capability as shown in Figure 14. In these terms, traceability of financial impact is clear.

The importance of traceability cannot be overemphasized. Traceability serves as a measure of credibility used by MAJCOM and Air Force-level budget program authorities to evaluate their decisions. Further, the return on investment illustrated by traceability in each program action serves as lessons learned to either follow a specific funding opportunity or reduce or cease funding altogether. Finally, effective traceability benefits the requesting unit by helping ensure funds are not redirected when they arrive on base but instead are applied to the problem identified to the budget process.

However, analysis of funding effects must consider how the context has changed between the time funds were originally requested and when they were applied. For example, additional equipment issues may have developed during the interim; the operations tempo may have changed, either worsening or easing the shortfall; aircraft may have deployed and increased or lessened the criticality; and finally, more critical shortfalls may have developed and eclipsed the current funding efforts. These possibilities do not usurp funding traceability but do emphasize the importance of accounting for all critical contributors and detractors from mission capability.

Wartime Requirements—SORTS Methodology

General SORTS Process. The formal SORTS process directly establishes and supports wartime readiness-reporting requirements. As described in Air Force Instruction (AFI) 10-201:

> SORTS has a threefold purpose: it provides data critical to crisis planning, provides for the deliberate or peacetime planning process, and is used by the Chief of Staff United States Air Force (CSAF) and subordinate commanders in assessing their effectiveness in meeting Title 10, "United States Code," responsibilities to organize, train, and equip forces for combatant commands. All units with an Air Force Personnel Accounting Symbol (PAS) code will be registered in SORTS.[21]

"Regardless of the source of a unit's tasking or the extent of unit capability tasked in operational plans (OPLANS), and so forth,

Violation #	Type Maintenance Issue	Short-Term Impact?	Long-Term Impact?	Weight
1	Delayed Discrepancies	No	Yes	0.1
2	Aircraft Wash	No	Yes	0.1
3	Aircraft Paint	No	Yes	0.2
4	WLT	No	Yes	0.2
5	Phase and Isochronal Inspections	Yes	Yes	0.3
6	Time Change Items	Yes	Yes	0.4
8	Mission Essential List Items	Yes	Yes	0.4

Table 2. Logistics Capability Violation Criteria

SORTS measurement is based on the unit's full wartime requirement for which it was organized or designed. This baseline is reflected in the definition of [the status rating] C-1" (ready for full wartime mission), and SORTS reports are focused on four key baselines of personnel; equipment and supplies on hand; equipment condition; and finally, training.[22] SORTS reports are prepared at the wing, submitted to the MAJCOM reporting organization, and monitored by Headquarters Air Force Operational Readiness, who "acts as liaison with the Joint Staff, Office of the Secretary of Defense, Congress, and Air Staff functional area manager for SORTS and related issues."[23] This highlights the direct role SORTS plays in gaining the attention of the budget leadership. Air Force Operational Readiness collects the SORTS reports and compiles them into the Quarterly Readiness Report to Congress (QRRC) for submission to the Joint Staff on a monthly and quarterly basis.[24] This provides a direct link to Congress, reflecting where shortfalls exist and where funding may be needed. In this process, SORTS captures unit wartime mission readiness; reports readiness status to the MAJCOM, Air Staff, and Joint Staff; and finally, goes to Congress for their consideration in the legislative (and budgeting) process.[25]

The basis for SORTS reporting and the key document holding direct meaning for group and squadron level commanders is the Designed Operational Capability (DOC) statement. As a function of wartime missions, the DOC is quite clear in capturing the requirements:

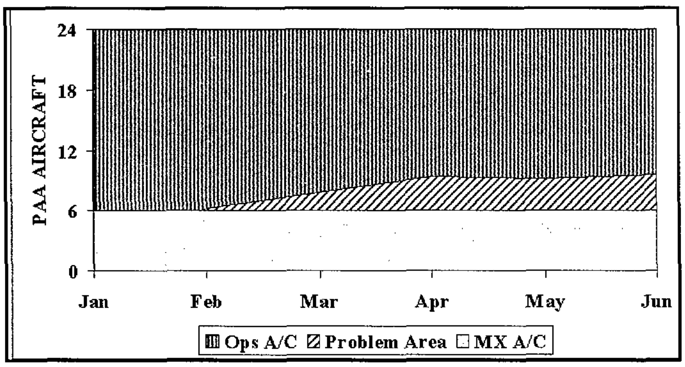


Figure 9. Locally Standardized Aircraft Distribution

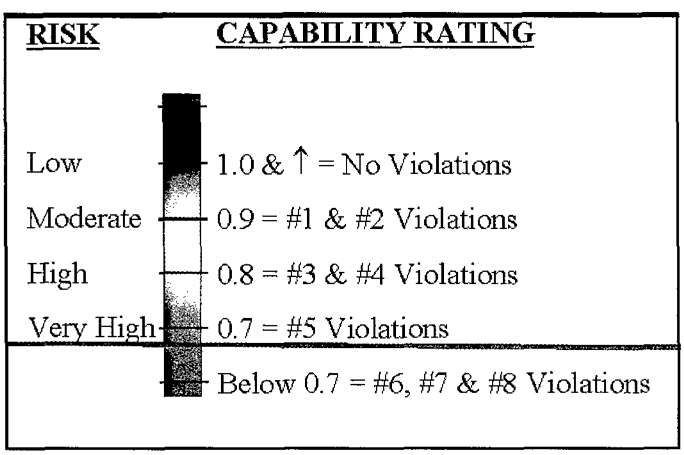


Figure 10. Maintenance Capability Rating Definition

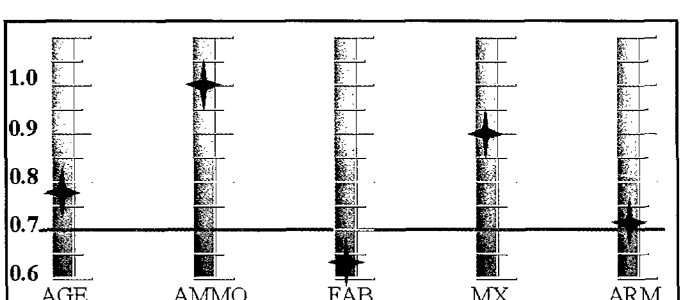


Figure 11. EMS Capability Ratings

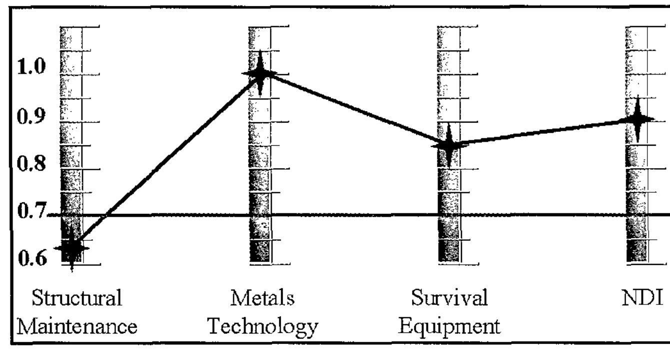


Figure 12. Fabrication Flight Capability Ratings

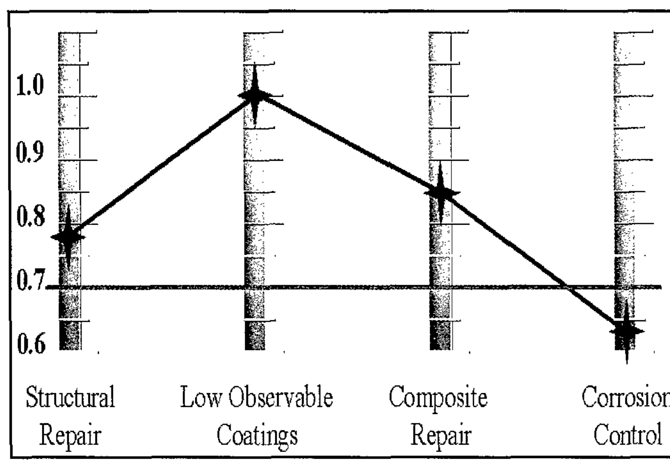


Figure 13. Aircraft Structural Maintenance Section Capability Ratings

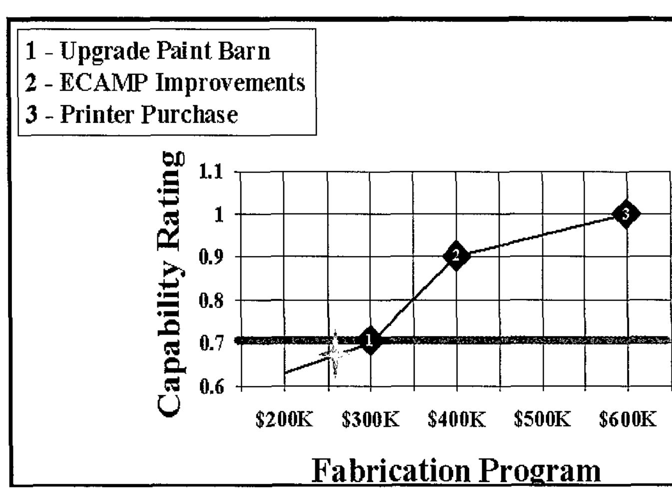
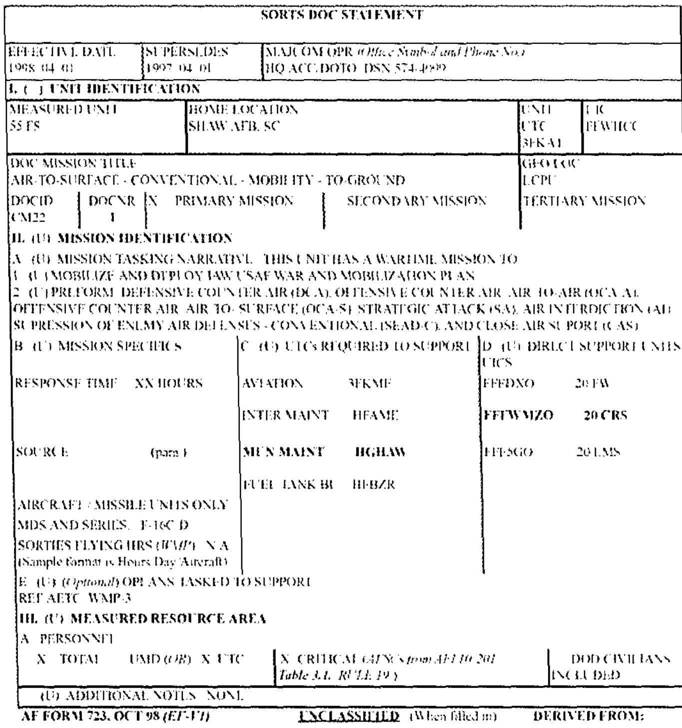


Figure 14. Fabrication Performance Value Assessment

The purpose for a SORTS DOC statement is to provide units with a single-source document of the information necessary and the location of the references specifying resources to measure and report in SORTS. They also provide a narrative description of the unit's wartime mission. All SORTS DOC statements will be completed on a standard or computer-generated AFF [Air Force Form] 723 or an XOOA approved facsimile.[26] (Figure 15)

Establishing logistics DOCs within each MAJCOM and wing can be achieved through procedures established in Air Force and MAJCOM instructions. As witnessed in USAFE, the preponderance of DOC statements are written for operational, not logistics squadrons. USAFE/LGW* recently changed this absence of logistics DOCs when it submitted DOC statements for the USAFE Logistics Commander's approval describing the



SORTS DOC STATEMENT

EFFECTIVE DATE 1998 04 01 | SUPERSEDES 1997 04 01 | MAJCOM OPR (Office Symbol and Phone No.) HQ ACC/DOTO DSN 574-4999

I. ( ) UNIT IDENTIFICATION

MEASURED UNIT 55 FS | HOME LOCATION SHAW AFB, SC | UNIT UTC 3FKA1 | UIC FFWHCC

DOC MISSION TITLE AIR-TO-SURFACE - CONVENTIONAL - MOBILITY - TO-GROUND | GEOLOC LCPU

DOCID CM22 | DOCNR 1 | X PRIMARY MISSION | SECONDARY MISSION | TERTIARY MISSION

II. (U) MISSION IDENTIFICATION

A (U) MISSION TASKING NARRATIVE. THIS UNIT HAS A WARTIME MISSION TO
1 (U) MOBILIZE AND DEPLOY IAW USAF WAR AND MOBILIZATION PLAN
2 (U) PREFORM DEFENSIVE COUNTER AIR (DCA), OFFENSIVE COUNTER AIR AIR-TO-AIR (OCA-A), OFFENSIVE COUNTER AIR AIR-TO-SURFACE (OCA-S), STRATEGIC ATTACK (SA), AIR INTERDICTION (AI), SUPRESSION OF ENEMY AIR DEFENSES - CONVENTIONAL (SEAD-C), AND CLOSE AIR SUPORT (CAS)

B (U) MISSION SPECIFICS
RESPONSE TIME XX HOURS
SOURCE (para)
AIRCRAFT / MISSILE UNITS ONLY
MDS AND SERIES F-16C D
SORTIES FLYING HRS (WMP) N A
(Sample format is Hours Day Aircraft)

C (U) UTCs REQUIRED TO SUPPORT
AVIATION 3FKMF
INTER MAINT HFAME
MUN MAINT HGHAW
FUEL TANK BU HFBZR

D (U) DIRECT SUPPORT UNITS UICS
FFFDXO 20 FW
FFTWMZO 20 CRS
FFF5GO 20 EMS

E (U) (Optional) OPLANS TASKED TO SUPPORT
REF AETC WMP-3

III. (U) MEASURED RESOURCE AREA

A PERSONNEL
X TOTAL UMD (OR) X UTC | X CRITICAL (AFSCs from AFI 10-201 Table 3.1, RULE 19) | DOD CIVILIANS INCLUDED

(U) ADDITIONAL NOTES NONE

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Figure 15. AFF 723, SORTS DOC Statement

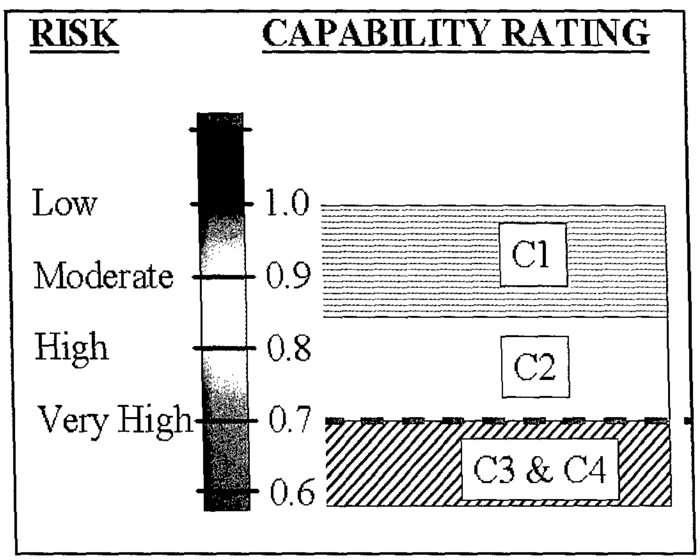


Figure 16. RAM Capability Using C-Ratings

wartime mission of war reserve materiel conventional munitions in support of the command's assigned OPLANs. In accordance with AFI 10-201, USAFE Sup 1,[27] The USAFE Logistics Commander approved the DOC statements, providing clear insight into the readiness of command conventional munitions to support assigned OPLAN operations. USAFE munitions readiness is now part of the SORTS process with readiness visibility being reported to both the Joint Staff and Congress. AFI 10-201, ACC Sup 1,[28] likewise provides authority to the logistics commander (or appropriate director) for DOC approval. The key is to determine the required personnel; equipment condition; equipment and supplies on hand; and finally, the training requirements to establish an effective baseline for adequate mission support. Once this baseline is established, readiness reporting is simply a function of how well each of these baselines is supported. In this same vein, shortfalls are identified, presenting a sound opportunity for funding to play a role.

SORTS and the RAM Process. SORTS provides a clear opportunity to establish meaningful performance measures and convey where the funding opportunities lie to improve capability. Starting with Figure 16, set values can be assigned to each capability measure on a one-to-one basis with the C-ratings. Similar to the peacetime requirements, specific program element code and PM-based capability profiles can be developed to highlight which squadron, flight, or section is driving the lowered rating (Figures 11 through 13), ending with submission through the RAPIDS process to fill capability and funding shortfalls (Figure 17).

SORTS provides visibility of capability shortfalls across a spectrum of funding sources. First, SORTS highlights the wartime readiness issues throughout the Air Force, starting at the unit level and progressing up to the Chief of Staff. Second, through the QRRC process, component commanders and the Joint Staff are informed of capability shortfalls. In fact, these shortfalls can be reflected on a component commander's integrated priority list as a means of emphasizing the importance of the issue to Joint Staff oversight. Third, the MAJCOM's QRRC submission will go before Congress, whether or not the issue is included in the integrated priority list. The end result is the SORTS process raises capability shortfall issues into the joint and congressional arenas for full consideration of the implications for future and current combat operations.

Wartime Requirements—ART Methodology

General ART Process. The system to organize the Air Force into an expeditionary force is already fully in place.

> The expeditionary aerospace force concept is how the Air Force organizes, trains, equips, and sustains itself by creating a mindset and cultural state that embraces the unique characteristics of aerospace power—range, speed, flexibility, and precision—to meet the national security challenges of the 21st century. The concept has two fundamental principles: first, to provide trained and ready aerospace forces for national defense and, second, to meet national commitments through a structured approach which enhances Total Force readiness and sustainment.[29]

The EAF is organized into:

> ...aerospace expeditionary forces; dedicated on-call aerospace expeditionary wings (AEW); lead mobility wings (LMW); and required air operations center (AOC) and Air Force Forces (AFFOR) command and control (C2) elements. Available Air Force

UTCs have been aligned equitably across ten AEF libraries so each possesses roughly equal capabilities. These libraries provide a composite of capabilities from which force packages are developed and tailored to meet mission requirements.[30]

As mission requirements dictate, "specifically tailored forces are presented to theater commanders as aerospace expeditionary task forces (AETF)."[31]

The ART has been developed and implemented to capture the readiness of units to support the EAF and the underlying AEF construct. In accordance with AFI 10-244, the ART reports the health of the ten AEFs, LMWs, and enablers. ART uses the UTCs as building blocks to provide Headquarters Air Force, Air Force component commanders, MAJCOMs, and the AEF Center readiness information to employ, manage, and sustain EAF operations. It also "provides units a mechanism to report a UTC's ability or inability and associated deficiencies in fulfilling its mission capability statement across the full spectrum of operations, to include contingency and steady-state operations."[32] Finally, it "provides information to aid resource allocation and tasking decisions during steady-state and crisis actions."[33] This reporting system takes advantage of existing capability reporting:

ART complements readiness data reported in Status of Resources and Training Systems (SORTS). ART focuses reporting on the modular scalable, capability-based UTCs designed to meet the needs of the 21st century force while SORTS is unit-centric with reporting based on major war (MW) commitments. The basis for both systems is the Air Force-Wide UTC Availability and Tasking Summary (AFWUS). The tasking baseline contained in ART is derived from the AEF time-phased force deployment data (TPFDD) library, which supports the full spectrum of operations. Readiness assessments for MW and AEF taskings must be considered together; however, the reporting guidelines for each may be independent. A unit's C-level, as reported in SORTS, may not directly correlate to its ability to support a specific UTC tasking as indicated in ART.[34]

ART and SORTS share some common justification through the DOC process. As described in AFI 10-244, the "UTC readiness assessment is based on resources that are expected to be mission ready within their [assigned] DOC response time."[35] Since the DOC is key to both SORTS and ART, the importance of developing logistics DOCs is a common goal for establishing a solid foundation for future funding efforts. The key difference between ART and SORTS, with respect to financial potential, is the size of the budget audience. ART is strictly an Air Force tool and is not used in the joint world. ART reports are not submitted to component commanders, the Joint Staff, or Congress.

Since the audience is limited, so too are the potential sources of funding. ART reports are submitted monthly and follow the chain of command through the wing, numbered air force, MAJCOM, and up to the Chief of Staff. This means ART can be used to highlight issues and possibly make the case for scarce funding support[36] within the Air Force budgeting system with no consideration from component commander, Joint Staff, or congressional budget leadership.

Reporting UTC viability within ART is accomplished through color-coded reports. As defined in Table 3, the green/yellow/red system quickly conveys UTC readiness to meet the mission. The bottom line is ART can be an effective means for capturing capability and identifying funding shortfalls with the understanding that it can be used only within Air Force confines.

ART and the RAM Process. ART also provides a clear opportunity to establish meaningful performance measures and where to improve capability. Starting with Figure 18, set values

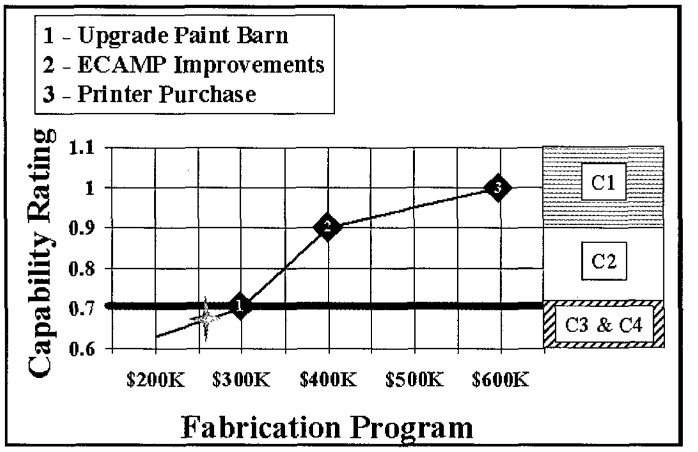


Figure 17. RAM Performance Value Assessment—SORTS Based

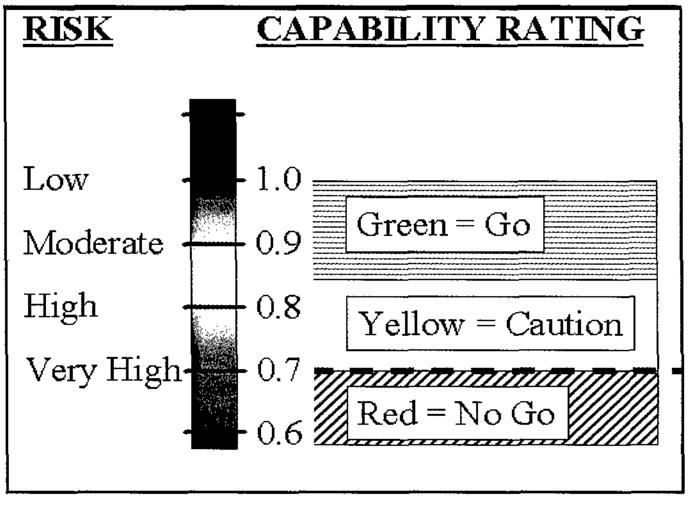


Figure 18. RAM Capability Using ART Color Ratings

Color	Description	Definition
Green	Go	All MEFPAK (MANFOR, LOGFOR) identified personnel, equipment, and training for the AEF allocated UTC are available for deployment within 72 hours of notification or sooner if subject to more stringent criteria.
Yellow	Caution	The UTC has a missing or deficient capability, but that missing or deficient capability does not prevent the UTC from being tasked and accomplishing its mission in a contingency or AEF rotation.
Red	No Go	The UTC has a missing or deficient capability that prevents the UTC from being tasked and accomplishing its mission in a contingency or AEF rotation.

Table 3. Logistics Capability Violation Criteria

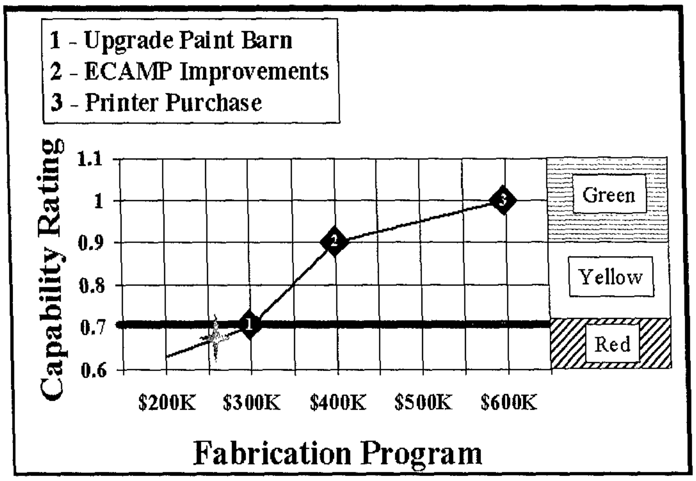


Figure 19. RAM Performance Value Assessment—ART Based

can be assigned to each capability measure on a one-to-one basis with the reported color-coded assessment. Similar to the peacetime requirements, specific program element code and PM-based capability profiles can be developed to highlight which squadron, flight, or section is driving the lowered rating (Figures 11 through 13) ending with submission through the RAPIDS process to fill capability and funding shortfalls (Figure 19).

Conclusions

The answer to the question "Can a method be developed to assist squadron and group logistics commanders to secure required mission funding" is an emphatic yes. Squadrons and groups must invest time and thought to compete effectively for funding resources at the MAJCOM, Air Force, and DoD levels. In other words, they spend the *time* to determine the requirements necessary to support the peacetime and wartime missions as well as the *thought* in applying the financial resources in a traceable manner. The key is to establish the fundamental requirements supporting the peacetime and wartime missions. When established, the requirements clarify not only the shortfalls identified from the logistics perspective but also mission impact to senior leadership. Once leadership understands the implications to the mission, more effective prioritization of resources throughout the unit is achieved more easily.

All the resources and processes for determining requirements, shortfalls, and a way ahead are available. DOCs (or the means to create them), analysis (from the Analysis section), readiness reporting (through SORTS or ART), funding requests (through the POM or other means), and traceability (to track effectiveness and seek further funding) combine to form an effective budget justification system. This is available to any commander who is ready to take resource management to a higher level and fund the first priority of the position: organize, train, and equip.

Notes

1. AFI 10-244, *Reporting Status of Aerospace Expeditionary Forces*, 19 Feb 02, 16
2. AFI 10-244, 16.
3. Michael A. Greiner, Kevin J. Dooley, Dan L. Shunk, Ross T. McNutt, "An Assessment of Air Force Development Portfolio Management Practices," *Defense Acquisition University*, Acquisition Review Quarterly, Spring 2002, 127 [Online] Available: http://www.dau.mil/pubs/arq/2002arq/DoolySP2.pdf.
4. DoD Directive 7045.14, *The Planning, Programming, and Budgeting System*, 22 May 84.
5. "06 POM JIT Master Briefing," AF/XPPE, 15 Jan 04 [Online] Available: http://www.xp.hq.af.mil/XPP/XPPTraining/XPP_Training_Page.htm.
6. *Ibid.*
7. Greiner, et al, 127.
8. HQ USAFE/XPP, *USAFE POM Handbook*, Jun 01, 35.
9. *USAFE POM Handbook*. 35.
10. *USAFE POM Handbook*, 37.
11. *USAFE POM Handbook*, 41.
12. *USAFE POM Handbook, 36.*
13. *USAFE POM Handbook*, 35-39.
14. *USAFE POM Handbook*, 41.
15. *USAFE POM Handbook*, 26-27.
16. *USAFE POM Handbook*, 4-42.
17. *USAFE POM Handbook*, 26-27.
18. AFI 11-102, *Flying Hour Program Management*, 5 Apr 02, 5.
19. AFI 21-101, *Aerospace Equipment Maintenance Management*, 1 Oct 02, 24.
20. ACC Instruction 21-118, *Logistics Maintenance Performance Indicator Reporting Procedures*, 10 Feb 03, 15
21. AFI 10-201, *Status of Resources and Training System*, 12 Dec 03, 8.
22. AFI 10-201, 9-10.
23. AFI 10-201, 20.
24. AFI 10-201, 20.
25. AFI 10-201, 8.
26. AFI 10-201, 13.
27. *AFI 10-201*, USAFE Sup *1*, *Status of Resources and Training System*, 23 Mar 01, 2.
28. AFI 10-201, ACC Sup 1, *Status of Resources and Training System*, 12 Jun 01, 4.
29. AFI 10-244, *Reporting Status of Aerospace Expeditionary Forces*, 19 Feb 02, 4.
30. AFI 10-244, 4.
31. *Ibid.*
32. AFI 10-244, 5.
33. *Ibid.*
34. AFI 10-244, 6.
35. AFI 10-244, 13.
36. *Ibid.*

Major West is Commander, 1 CMS, Langley AFB, Virginia. At the time of the writing of this article, he was a student at the Air Command and Staff College (ACSC), Maxwell AFB, Alabama. Major Pohlman is an ACSC faculty member.

notable quotes

Character is what you are. Reputation is what others think you are. The reason that some fail to climb the ladder of success, or of leadership if you want to call it that, is that there is a difference between reputation and character. The two do not always coincide. A man may be considered to have sterling character. Opportunity might come to that man; but if he has the reputation for something he is not, he may fail that opportunity. I think character is the foundation of successful leadership.

—Major General Lucien Truscott

Although the Department of Defense (DoD) has made great strides in improving the visibility of its cargo and equipment since the days of Operation Desert Storm, the DoD continues to struggle with providing efficient and effective intransit visibility (ITV) to the warfighters.

contemporary issues

Comparing EPR Supply-Chain Management Solutions

In "Comparing EPR Supply-Chain Management Solutions" the authors identify commercially available ERP-based logistics software packages and determine whether they are capable of providing the same functionality as the two Air Force transportation information systems currently employed. Information on the logistics software provided by SAP, Oracle, and PeopleSoft was collected and a gap analysis was conducted to identify the degree of similarity between the Air Force and commercial systems. The results of the research indicate SAP provides the highest percentage of similarity with each of the Air Force systems, followed by Oracle and then PeopleSoft. Although all three software packages provide a substantial number of functions found in Global Air Transportation Execution System and Cargo Movement Operations System, none of the systems offers 100 percent of the transportation functions provided by the current Air Force systems.

The article demonstrates COTS enterprise solutions exist that may be applicable to Air Force logistics processes and may provide a feasible approach toward achieving a single, integrated logistics information system. Furthermore, the results may serve as a useful foundation for AFLMA's 8-year project, which is intended to determine the information needs of the Air Force logistics community before adopting a commercially provided ERP system.

Comparing ERP Supply-Chain Management Solutions

Captain Patrick S. Holland, USAF
Major Kirk A. Patterson, USAF
William A. Cunningham III, PhD

Introduction

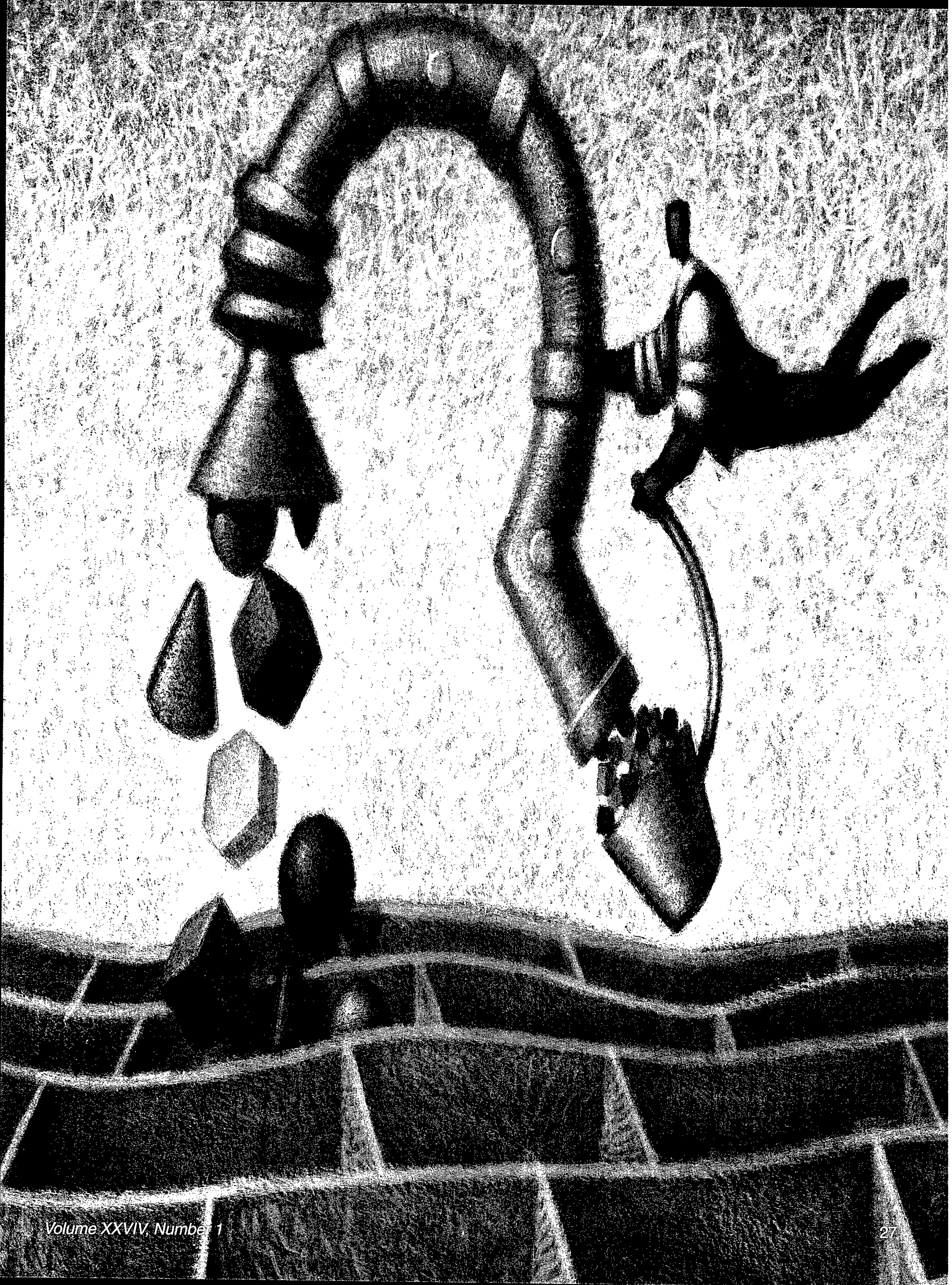
During the 1991 Gulf War, more than 40,000 containers of supplies and equipment were shipped to the Persian Gulf with inadequate markings, labels, and identification. No one could identify the contents of each container or to whom the contents belonged. The only solution was to open and inventory each container to determine the proper disposition of the items.[1] When the war ended, the US military still had 8,000 containers that remained unopened that later were found to contain spare parts worth $2.7B.[2] This lack of cargo visibility caused warfighters to place thousands of duplicate requisitions just to ensure they had items needed to accomplish daily operations.[3] These requisitions slowed down the logistics pipeline and eventually caused a congestion of backlogged cargo at the stateside aerial ports.[4] These problems further added to the frustration of not being able to account for assets within the theater of operations.

Although the Department of Defense (DoD) has made great strides in improving the visibility of its cargo and equipment since the days of Operation Desert Storm, the DoD continues to struggle with providing efficient and effective intransit visibility (ITV) to the warfighters. In a preliminary report, the General Accounting Office (GAO) stated, "DoD did not have adequate visibility over all equipment and supplies transported to, within, and from the theater of operations in support of Operation Iraqi Freedom."[5] The report also noted:

> Units operating in the theater did not have adequate access to, or could not fully use, DoD's logistics and asset visibility systems in order to track equipment and supplies because these systems were not fully interoperable and capable of exchanging information or transmitting data over required distances.[6]

The Joint Center for Lessons Learned also reported numerous logistics problems during Iraqi Freedom, such as inadequate asset visibility, inconsistent logistics communication and interoperability, inadequate training on various logistics information systems, and the frequent occurrence of *pushing* supplies through the system because of asset visibility problems.[7] Additional evidence of continued ITV difficulties is that the US Transportation Command (TRANSCOM), Air Mobility Command (AMC), and Air Force Materiel Command all found it necessary to set up ITV cells during Iraqi Freedom to assist in locating and tracking mission critical cargo.[8]

One of the primary reasons the DoD lacks system interoperability and information exchange is because some organizations continue to rely on stovepiped legacy information systems that lack robust and dynamic data-integration capabilities.[9] For example, the Air Force continues to use two separate legacy information systems to maintain intransit visibility of DoD cargo and personnel even though, in 1994, the DoD issued a memo emphasizing the use of commercial-off-the-shelf (COTS) products because of the private sector's ability to provide better technology for integrating information systems.[10]



The purpose of this exploratory study was to examine whether commercial Enterprise Resource Planning (ERP) software packages are capable of providing the same functionality as two primary transportation information systems currently used by the Air Force to support ITV: the Cargo Movement Operations System (CMOS) and Global Air Transportation Execution System (GATES). In a previous comparison of GATES and CMOS, 290 transportation functions were identified and used as a baseline to compare software functionality between the Air Force systems and three commercially available ERP software packages.[11]

Air Force Information Management Systems and Intransit Visibility

The Air Force primarily relies on two transportation information management systems to process cargo and passengers through the Defense Transportation System (DTS): CMOS and GATES.[12] Both systems have evolved from legacy systems created during the 1980s and continue to supply the information needed to manage cargo and passenger movements and maintain intransit visibility.

Developed in the mid-1980s and achieving full operational capability 1 January 1995, CMOS is a "combat support system that provides automated base-level processing for *cargo movements during peacetime* and for both...*cargo and passenger movements during contingencies* [emphasis added]."[13] In January 2002, CMOS was approved by the Joint Transportation Management Board to become the Joint Installation Transportation Officer/Transportation Management Office module of the Transportation Coordinator's Automated Information for Movement System II.[14] This recognition was a major milestone for the program because it meant CMOS was recognized officially throughout DoD as the system responsible for supporting the joint transportation requirements for each of the service branches.[15] CMOS currently is used at 206 locations worldwide, including nine Marine locations, six Navy locations, and one National Security Agency location.[16]

CMOS supports ITV by electronically sending cargo and passenger data to the Global Transportation Network (GTN). GTN is TRANSCOM's customer-focused, automated information system that provides near real-time visibility for all cargo shipped throughout the DTS.[17] Since its inception in August 1989, GTN has evolved from a software-installed application to a Web-based ITV tool capable of being accessed by anyone who has a valid need and has received permission to use the system.[18] The system's strength comes from its ability to operate in a shared data environment and access transportation data from 25 government and 50 commercial logistics information systems.[19] Figure 1 represents the various information systems that feed data into the GTN system.

CMOS also enables ITV by transmitting advance shipping notices to other CMOS locations. Once a shipment arrives at a receiving location, freight personnel can quickly in-check the cargo because the shipment data are already in the system. This helps maintain data accuracy and allows the shipment information to be updated more efficiently.[21]

GATES is:

> Air Mobility Command's aerial port operations and management information system designed to support automated cargo and passenger processing, the reporting of intransit visibility data to the Global Transportation Network, and billing to Air Mobility Command's financial management directorate.[22]

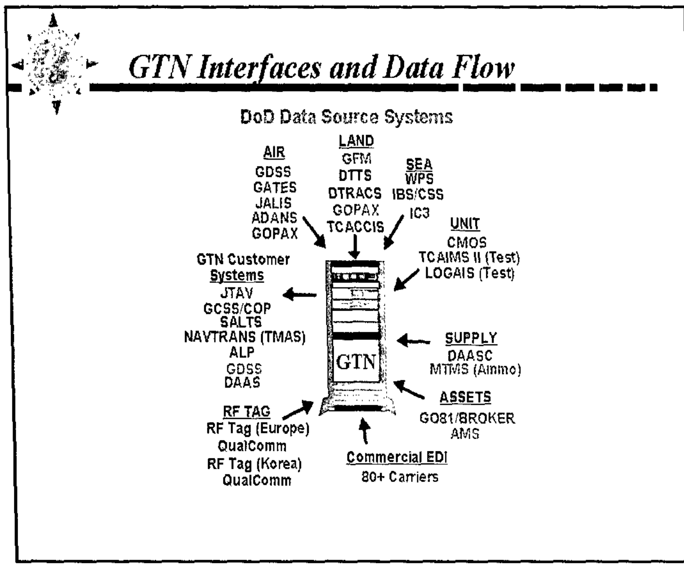


Figure 1. GTN Interfaces and Data Flow[20]

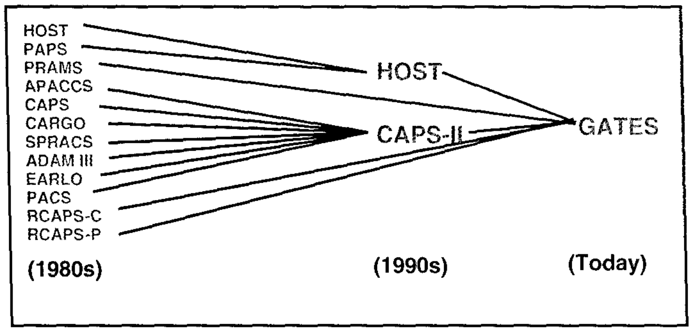


Figure 2. AMC's Migrated Transportation Systems[26]

GATES has evolved from a series of AMC legacy transportation systems and is intended to support TRANSCOM's DTS 2010 Integration Plan by being a fully integrated transportation information system for AMC (Figure 2). Currently, the system has more than 10,000 active users and is located at 20 major aerial ports.[23] RGATES (Remote Global Air Transportation Execution System) is AMC's stand-alone version of GATES and carries the same functionality except that the system is capable of running off a regular PC desktop or laptop.[24] RGATES is being used at 28 sites throughout the world.[25]

In July 2001, the Air Force Logistics Management Agency (AFLMA) was tasked to examine these two systems because of the apparent overlap of functions. The overall objective of the study was to find a way to maintain the same functionality required for processing cargo and passengers through the DTS while eliminating duplication of effort between the two systems.[27] The study identified 11 functional areas and 290 transportation functions between the two systems. Captain John W. Winkler, AFLMA Project Manager, noted 153 of the 290 functions (53 percent) were similar.

AFLMA's study pointed out several problems with operating and maintaining the two information systems. First, many transportation persons use one system for peacetime operations while having to use another system during contingencies. Traffic

management personnel (2T0XX) use CMOS during peacetime operations but rarely use the CMOS deployment module. However, air-transportation personnel (2T2XX)—approximately 80 percent are assigned to AMC—use GATES on a routine basis but are required to use CMOS during deployment exercises and real-world contingencies.[28] The report notes, "This presents a significant training problem for 2T2XX personnel, especially at aerial ports, since they use CMOS only for Air Force deployments, usually only once or twice a quarter."[29] Furthermore, Winkler points out, "This situation is exacerbated since the CMOS deployment module is not taught in either 2T2 or 2T0 3-level technical training courses; training is left up to individual bases."[30] This makes it difficult for air-transportation personnel to become proficient in using both systems.

AFLMA also noted two major obstacles to integrating data between the two systems. First is the "dissimilarity in systems communication."[31] The information systems are unable to exchange information or data directly with each other, and thus, cargo and passenger data must be manually input into either system even though they may already exist in the other. As noted in the study, "This results in duplication of effort for transportation personnel to maintain intransit visibility of cargo and passengers."[32] Therefore, AFLMA concluded:

> Preliminary study demonstrates the need for greater data integration; recommend accomplishment of this by leveraging Electronic Data Interchange technology or other exchange technology to integrate data as if GATES and CMOS were a single system.[33]

In a followup study, AFLMA identified the lack of policy guidance as the second major obstacle to data integration.[34] This study recognized that although the "processes for sustainment, deployment, and redeployment are generally the same, policy does not provide sufficient guidance to ensure efficient data exchange to manage and maintain visibility over cargo and passengers."[35] Thus, AFLMA recommended implementing policy guidance changes, as well as adopting data-sharing technologies to improve system integration.

Comparisons

In this study, the 290 functions of CMOS and GATES were compared with functions provided by the three largest software suppliers of ERP-based supply chain management (SCM) solutions. The three largest companies—SAP, Oracle, and PeopleSoft—were included, as it was believed these companies would have the resources and experience necessary to provide and implement a cargo and passenger processing system on a large scale as required by the Air Force.[36] Since the conclusion of this study, Oracle bought PeopleSoft for $10.3B, making it the second largest business-management software company in the world.[37]

Data were collected from documents and interviews. A gap analysis then was used to identify the similarities and differences between the transportation information management systems. Gap analysis is "a technique designed to assess the gap that can exist between a service that is offered and customer expectations."[38] Although this technique usually is associated with analyzing surveys, gap analysis also can be applied in comparing functionality between two systems.[39]

The AFLMA study categorized the CMOS and GATES functions into 11 functional areas. Table 1 presents these categories and the capabilities supplied by the three commercial packages. All three vendors provide complete coverage of 7 of the 11 functional areas. The four functional areas with limited support are discussed in detail below.

Functional Areas	SAP	Oracle	PeopleSoft
System Administration	C	C	C
Surface Cargo Processing	C	C	C
Air Cargo Processing	C	C	C
Automated Identification Technology	85.7	88.1	0
Deployment Management	100	25	12
Passenger Processing	88.1	0	0
Resource Management	C	C	C
Decision Support	C	C	C
System Communication	C	C	C
World Wide Web	53.8	7.7	23.1
Mission Status	C	C	C
Note: C represents a complete capability provided by software vendor.			

Table 1. Percentages of Functionality Provided by Commercial Software Packages

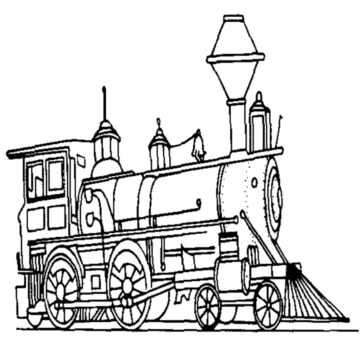
Detailed examination of the data reveals PeopleSoft currently does not provide any of the functionality required for automated identification technology, while SAP and Oracle provide roughly 86 and 88 percent respectively. The project manager of logistics for PeopleSoft reported they are working to provide the automated identification technology within the next 12 months.[40] SAP is able to provide 100 percent of the deployment functions contained in the Air Force systems. Once again, Oracle and PeopleSoft information packages fall substantially short of SAP. The results indicate Oracle and PeopleSoft provide no more than 25 percent of the functions currently being used by the Air Force with its own systems. During an interview with PeopleSoft's project manager for logistics, he admitted that, because of the dynamic nature of military deployments, the current version of its logistics information software would probably be unable to meet the demanding requirements.[41]

With respect to the passenger-processing function, both Oracle and PeopleSoft are unable to perform any of the current passenger-processing functions of CMOS and GATES. In contrast, SAP has more than 88-percent functional similarity with the Air Force combined systems (Table 1). Even though Oracle does not provide passenger-processing functionality itself, it does have partnerships established with other companies that are capable of providing that functionality. For example, under Oracle's Partner Network Solutions Catalog, Ultra Electronics Limited provides the technology for a flight-information display system.[42] The company also is capable of setting up a baggage reconciliation system to manage and track baggage security.[43] However, researching the functions that business partners can provide was beyond the scope of this article.

The final area of limited support was World Wide Web functionality. Surprisingly, none of the packages was able to provide 100-percent support. SAP once again provides the most support with roughly 54-percent similarity. Oracle and PeopleSoft provide less than 25 percent of the Web-based transportation functions of GATES and CMOS.

(Continued on page 44)

the defeat of the south
Railroads and Wagons



Confederate States Army generals grasped the railroad as a novel panacea for the difficulties of war.

While railroads and wagons needed to be, they were not regarded by the Southern higher direction of the War Between the States (the Rebellion) as an integrated mechanism upon which victory in modern war depended. The nature of the Southern people was such that they saw battle as the object, whereas given their advantage of internal lines, they should have adapted a Vaubanian series of defensive strong points with mobile forces in between based on railheads.

Railroads in the South in 1861 were of many gauges, of limited rolling stock, and running on lightweight bar-iron track on unballasted ties. Though ticketed-through passengers could travel from one line to another, cars could not, so all freight had to be transshipped at terminal junctions. Private property and profit, together with states' rights, militated against efficiency once war began. Yet the vision of a through service from New York City via Norfolk, Virginia, to New Orleans was proposed in April 1861 but, for various reasons, never started.

Once war broke out, Confederate States Army (CSA) generals grasped the railroad as a novel panacea for the difficulties of war. Men, materials, guns, and munitions could be moved rapidly and unloaded at the station nearest to the battlefield. There were two major difficulties in the rainy South. The first was storage had to be built ahead of time to protect and preserve supplies. And second, someone who understood single-track railway operations had to manage the system. In 1861, both sides envisioned a short war with one battle—Bull Run or First Manassas—settling everything. But it did not, and the next nearly 4 years showed the side that understood, managed, and controlled not only the railroads but also the national political economy, including field transport, had a distinct advantage.

In January 1862, the North coerced the railroads with a threatening Act of Congress that gave the Government power to take over any line that did not give Union business priority. The South took years to reach such a law, and then President Davis would not enforce it, except for a few weeks to get supplies to beleaguered Richmond and Petersburg. As a result, Confederate shipments languished along the way, offloaded beside the tracks in the hot sun and rain usually at transshipment points. So meat sent from Nashville, which should have gone through on an interchange system in 5 days, took up to 9 and was inedible and condemned when it arrived in Richmond.

The standard freight train consisted of a 25-ton 4-4-0 locomotive of limited tractive effort and ten cars holding 8 tons each. For every day it was late, the railroad was deprived of the use of those ten cars. If a train was 90 days en route over some 700 miles, in theory, 6,800 tons of capacity were lost—or at 184 tons a day, 37-days' supplies for General Robert E. Lee.

If the proposed 1,000-mile New Orleans to Richmond through freights had been run, the companies involved would have had to work out scheduling and passing on 18x56-mile segments each containing four 14-mile blocks, all on 5-foot gauge. The whole, not counting spares, would have required 108 locomotives and 1,080 boxcars. This was beyond the wartime capacities of the South as virtually all locomotives and most rolling stock were imported from the North.

By mid-1863, the railways were hurting for lack of a national grand strategy that recognized the technical nature of modern war.

When war began, the Southern government decreed that all metal works should devote themselves solely to munitions production. This deprived most of the 113 Southern rail lines of spare parts, especially chilled tires for locomotives, and severely limited repairs and rebuilding of rolling stock and right of way. And then later in the war, scarce mechanics were conscripted if they had not, together with irreplaceable rails, been coopted by the Navy to build ironclad gunboats.

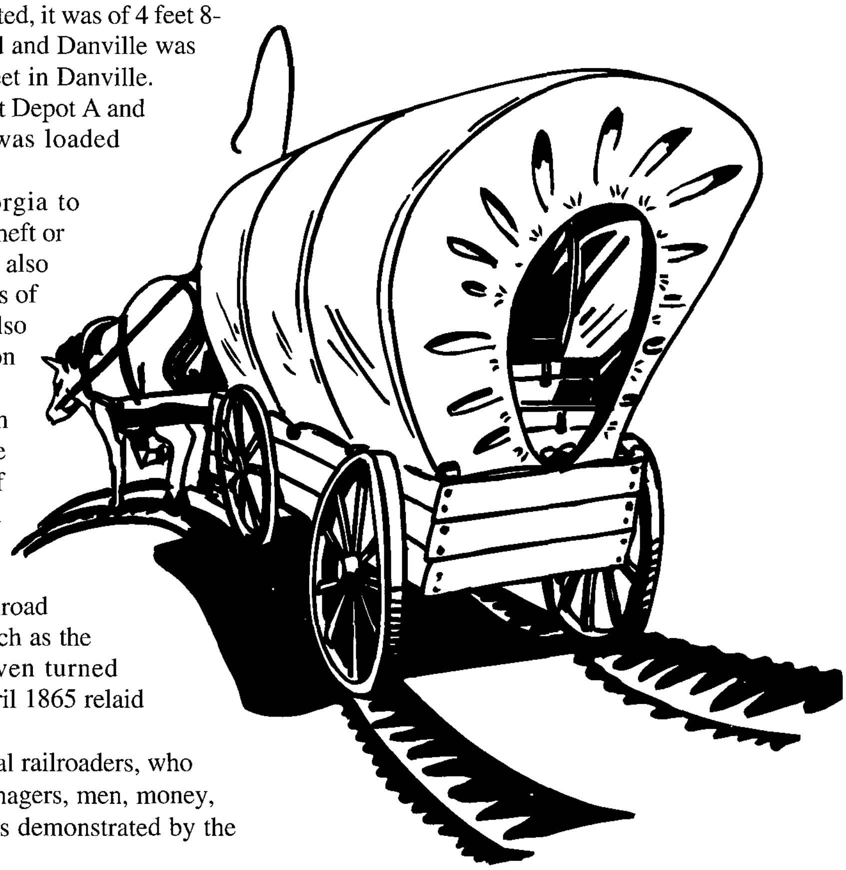
By mid-1863, the railways were hurting for lack of a national grand strategy that recognized the technical nature of modern war. On some lines, half the locomotives were awaiting repairs, and the freight cars were in a decrepit state, thanks to overuse, abuse by troops, and lack of replacements. A further difficulty was that neither Richmond nor the generals understood the need for ruthless, conserving methods. Southern generals ordered rails torn up, bridges burned, and lacked the foresight to commandeer locomotives and rolling stock to other lines rather than destroying them. Nor did Richmond lean on the Confederate Congress and state legislatures to rush through the important Piedmont Railroad between Greensboro, North Carolina, and Danville, Virginia. And when in mid-1864 it was completed, it was of 4 feet 8-1/2 inches North Carolina gauge, whereas the Richmond and Danville was 5 feet. Everything had to be transshipped across the street in Danville.

It could take up to 4 days to unload a 100-ton freight at Depot A and move it across town to Depot B, whether or not it was loaded immediately into another company's cars.

The disappearance of grain shipments from Georgia to Richmond starting in 1863 was due not only to civilian theft or unauthorized commandeering by local commanders but also to leakage from cars in ill-repair to the tune of 20 bushels of grain an hour through a hole only 6 inches square and also to the depredations of rats. This is not to mention losses on slow schedules and at transshipment points.

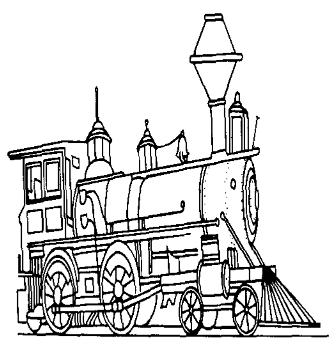
It is quite true that the railroads were in dire condition by 1864. It is also true that they got bad press in the newspapers, especially from the February 1865 report of the Commissary-General, who blamed his shortages on the inefficient railways and upon the flabbiness of the Richmond government, which failed to implement professional recommendations. But a reading of the railroad companies' annual reports shows that some of them, such as the Richmond and Danville, managed very well and even turned adversity to their own advantage—the R&D had by April 1865 relaid 135 of 146 miles with heavy rails.

Study of the US Military Railroad, run by professional railroaders, who supported the Union, shows what could be done by managers, men, money, and materials focused on getting the job done. This was demonstrated by the support from Sherman's Atlanta Campaign in 1864.



But railroads were only the arteries of a transportation complex, which also included wagons. My argument here is that the South, because of its very petite urban nature and because of its stratified rural agricultural population, was short of wagons. It is based on careful calculations of the possible number of wagons in the United States in 1860, a task made difficult by the fact that these vehicles were not included in the census of 1860 or in related occupational terms that are ill-defined and inconsistent.

Basing my analysis on four and one-half persons in a white family owning a 2,000-pound capacity wagon, three free-colored families having one, and urbanites being supplied by 26 wagonloads daily per 1,000 inhabitants, I then had to take that possible aggregate, refine it by recognizing that 20 percent of Southerners were poor whites and that another 20 percent were frontiersmen living in clearings of 100 acres or less in the forests and that these people were misclassified by a census that was, like Doomsday Book in Medieval England, interested in taxable wealth. These Scotch-Irish were cattle and swine raisers and drovers. They, too, had no wagons. That left farmers who owned more than 100 acres up to planters who, depending on the soil, owned several hundred. The grand estimated total of wagons in the South was 232,800 versus 4,360,000 in the whole United States in 1860. Of those in the South, the planters are estimated to have had 197,700, which they refused to allow to be requisitioned. That means that the CSA had available to it 25,900, including the 15,750 needed to supply the cities, or at best 10,150.



But railroads were only the arteries of a transportation complex, which also included wagons.

The Army of Northern Virginia at Gettysburg needed 1,800 and had 1,500 awaiting repair. General James Longstreet in early 1863 could not move requisitioned supplies from Suffolk County for shortage of transport, and Lee did not have the wagons to recover grain only 50 miles northeast of Richmond. In mid-1864, General Joseph Johnston was certified by the Inspector General of Field Transport to be 1,000 wagons short for a campaign back into Tennessee. And when Lee retreated to Appomattox in April 1865, he lost 200-400 wagons at Sailor's Creek and on the 9th surrendered only 104.

Apart from the estimate that the South started out deficient, what else happened? Management again. Southern gentlemen loved to ride, hunt, and gamble, but they left looking after wagons to slaves. And the ordinary soldier did not do manual work. So unless there were slaves or free-colored present, wagon wheels did not get greased every 5 days, and the bodies got no repairs. Besides, generals, such as Johnston, left a trail of broken and abandoned vehicles.

General Sherman beat Johnston from Dalton to Atlanta, Georgia, because, while Johnston bound himself to the railway, Sherman was 5 days ahead of his USMRR railhead and had 2,500 well-maintained wagons with which to outflank his opponent. He understood that modern war combined the old and the new.

In addition to a scarcity of wagons, the South also was short of draft animals. By 1864, the eastern South had lost nearly 25 percent of its population and more than half of its horses. Proof that it lacked wagons is the statement that in February 1865 the CSA needed only 11,500 horses and mules and might only be able to find 5,000 for cavalry, artillery and train.

One must conclude that the South was destined for defeat by its own inability to manage a modern war. This should become plainer as more studies look at the Confederate picture and not just at the battlefields.

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notable quotes

A flock of sheep led by a lion will prevail over a herd of lions led by a sheep.

—**Ancient Fable**

Sure It Is Effective, but Is It Suitable?

Captain John W. Garrison, USAF
Master Sergeant Stephen W. Clay, USAF
Technical Sergeant Jeffrey J. Kile, USAF

Introduction

Sure, your weapon or avionics system may be operationally effective, but is it operationally suitable? Is it reliable, maintainable, and available when a maintainer or operator needs it to be? These are questions the operational suitability analysts (OSA) of the 28th Test Squadron's newest division at Eglin AFB, Florida, ask members of test teams on a daily basis. The mission of the 28th is to evaluate the effectiveness and suitability of weapon and avionics systems that are being procured or improved to support current and future Air Force air combat missions.

In recent years, the amount of suitability analysis performed for a test had been based on the project manager's and team member's experience (or lack thereof) in suitability. Emphasis on system performance, costs, and schedules resulted in an unstructured approach to suitability analysis. This meant that effectiveness portions of an operational test and evaluation (OT&E) were done very well, while suitability was sometimes lacking. In an effort to establish a formal mechanism to ensure a standardized approach to suitability analysis, the 28th stood up the Operational Suitability Division in February 2004. This article describes just a few of the issues and concerns being addressed by logisticians in the Operational Suitability Division and how it supports the Air Force OT&E mission.

The mission of this new division is to ensure reliable, available, maintainable, and cost-effective systems are designed to meet the user's peacetime and wartime readiness requirements with the necessary support infrastructure. Operational suitability analysts make certain that suitability is included in the system performance specifications so that the system is designed to be supportable. They ensure all necessary support resources (technical data, spares, facilities, support equipment, training, manpower, and so forth) have been acquired, proven, and provided to the users.

Operational suitability analysts operate the same way as their effectiveness-driven operations analyst counterparts. As projects are approved and project managers request team members, operational suitability analysts are assigned to projects based on the career-field experience needed and test priority determined by Headquarters Air Combat Command (ACC). Once assigned, each operational suitability analyst works to achieve two immediate divisional goals. First, they ensure that suitability is addressed as early as possible in the life of the project by seeking opportunities to provide suitability inputs during the writing of the project or test plan. Second, they make sure that suitability analysis efforts produce the desired outcomes or products to support the warfighter. That is, they find the problems before the warfighter does.

Operational suitability analysts perform as maintenance and logistics subject-matter experts while evaluating suitability issues. They do this by developing and reviewing test plans and final reports; formulating specific suitability test objectives, methods of evaluation, and performance and evaluation criteria; retrieving and analyzing maintenance data; developing questionnaires for maintenance technicians; evaluating technical data, tools, and support equipment; validating equipment diagnostics; and assisting project managers in reviewing, submitting, and tracking deficiency reports.

Operational suitability analysts also serve as the project manager's maintenance liaison during test execution by ensuring operationally realistic scenarios are addressed and developed. They work hand in hand with maintenance evaluation teams, making sure all maintenance actions and findings are documented and reported. Additionally, operational suitability analysts identify direct and indirect maintenance and logistics impacts of the system under test by staying aware of changes in maintenance concepts, inspection requirement intervals, availability of spares, and changes in manning or training requirements. Their aim is to anticipate all impacts on the new system so the warfighter does not have to develop costly workarounds after it reaches the field.

What Is Suitability?

Operational suitability is the degree to which a system can be placed satisfactorily in field use with consideration given to

availability, compatibility, transportability, interoperability, reliability, wartime usage rates, maintainability, safety, human factors, manpower supportability, logistics supportability, documentation, and training requirements. The most operationally effective system can be deemed ineffective if it cannot be supported and, therefore, is unsuitable for operational employment. Considerations to reliability, maintainability, and availability make up the bulk of suitability testing, which are intricately related and are discussed briefly next.

Reliability is the duration or probability of failure-free performance. The challenge in reliability testing is to reduce the amount of system maintenance and servicing downtime, thus increasing the availability of the system. A common term used to express reliability is mean time between failures (MTBF). MTBF is expressed as the total operating time (for example, flying time, driving time, or system-on time) divided by the total number of failures. The definition of what is considered a failure must be included in the test plan to ensure it includes all operational influences, not just system design problems. Usually, long test periods are needed to measure system reliability accurately. With time and money always a constraint, sometimes a larger number of items are tested for a short time instead of a few items for a long time; for example, testing six items for 200 hours each versus testing three items for 400 hours each. Although the test time for each scenario is the same (1,200 total hours), the suitability analysts need to determine if there are any decreased reliability issues or *wear out* failures between 200 and 400 operating hours. There are risks involved with this approach, but they can be minimized by using other test data to demonstrate the risk is acceptable and that significant wear-out failure modes have not occurred in longer duration testing and are unlikely to occur during operational use.

Maintainability is defined as the ability of an item to be retained in or restored to a specified condition when maintenance is performed by personnel having specified skill levels, using prescribed procedures and resources, at each prescribed level of maintenance and repair. There are three dimensions to determining system maintainability. First, there is the average corrective maintenance time required to restore the system to a mission-capable condition. This is how long a system will be under repair after *mission critical* failures. The second dimension encompasses the corrective maintenance time for *any* failure. Times to correct *any* maintenance actions may be longer or shorter than the time to correct *mission critical* failures. When determining the average corrective maintenance time, the total number of hours of active repair time divided by total number of incidents requiring corrective maintenance, it is important to define the meanings of corrective (unscheduled) and preventive (scheduled) maintenance and define start and stop times for each measure. Finally, the third dimension to consider is the manpower required to perform the required maintenance actions. If it takes 3 man-hours for an average repair, there is a considerable difference between one person's working 3 hours or three people, each working 1 hour. Improved fault isolation through more accurate built-in test capabilities and automatic test equipment also can increase maintainability. Improved maintainability can reduce the number of spares and maintenance actions while simultaneously reducing the need for specialized test equipment and personnel.

Availability addresses the degree to which an item is in an operable state at the start of a mission or when demanded at some undetermined time in the future. Operational availability is considered a function of reliability and maintainability. The type of system must be considered and can range from the entire aircraft to smaller individual systems that make up the entire weapon system. Some systems may be required to operate continuously 24 hours a day. Others spend time in a ready status and perform their mission at defined intervals. Operational availability is measured by dividing the total system uptime by the total uptime plus total downtime. In aircraft maintenance terms, this is the mission-capable rate. A few failures randomly distributed during short test periods may skew the calculated availability and misrepresent what actually may be observed in an operational environment. An immature system may experience numerous failures (infant mortality break rate) and may take longer to return to an operational status because a learning curve has not been established. In these cases, the limitations on the availability measure must be recognized. Other actions like administrative logistics delay times (ALDT) also must be addressed. These include time taken for maintenance and supply technicians to cross reference part and stock numbers, time to order the part, and time for the part to be delivered. ALDT should be representative of the actual time occurring in operational units. Improved availability not only will increase the number of available assets on a daily basis but also will allow units to perform a particular mission with fewer assets.

Early OSA Success

Shortly after standing up 1 year ago, the Operational Suitability Division provided OSA support to the ACC-directed operational utility evaluation (OUE) of the fighter aircraft command-and-control enhancement (FACE) pod on the F-16 and A-10 aircraft. US Central Command Air Forces validated an urgent and compelling requirement to establish a robust, beyond-line-of-sight command-and-control communications capability for fighter aircraft operations throughout Afghanistan, without additional communications infrastructure. This new capability would allow the combined air operations center to contact an aircraft via a satellite telephone call and pass real-time weather, target, and intelligence information to the pilot. To get this new capability into the hands of the warfighter as quickly as possible, organizations from both Air Force Materiel Command and ACC conducted a combined developmental and operational quick reaction test.

Test events consisted of both ground and flight events, with the ground events including technical order validation, ground checks, and loading verification procedures. Early OSA involvement identified reliability, maintainability, and availability issues associated with the FACE pod. Although current unit support equipment was suitable to upload and download the FACE pod, not all toolboxes contained the deep well 7/16 socket required to tighten FACE pod snubbers. During loading verification, the short umbilical cord on the prototype FACE pods made it difficult to install on an LAU-105 missile launch rail. Options for carrying AIM-9 missiles and a FACE pod on a dual rail adapter/launcher on the A-10 were not determined adequately; this was forwarded to the A-10 System Program Office for resolution.

Ground maintenance tests were able to determine that external built-in test and system status lights on the FACE pods were incompatible with night-vision goggles because the type of light-emitting diode used represented a source of hostile lighting for other aircraft during nighttime operations. In the end, the FACE pod proved not only effective but also suitable for use during this quick reaction OUE. Based on testing performed by the operational suitability analysts and other logistics team members representing all the Air Force logistics disciplines, the 53d Wing Commander was able to recommend fielding this system for immediate use in the area of responsibility within 1 year of receiving the tasking to design and test a new capability. The lead operational suitability analyst on this project, Master Sergeant Steve Clay, became so knowledgeable on FACE pod operation and loading procedures, he was selected as the ACC subject-matter expert. He subsequently was tasked to supervise the load training of 926th Fighter Wing (Air Force Reserve Command) maintenance personnel in preparing for their upcoming deployment in support of Operation Iraqi Freedom, the first operational use of the FACE pod.

Conclusion

While only a year old, this new group of operational suitability analysts already has made an impact on the 53d's tests and, most important, the warfighter. However, there is still a lot of room for improvement. The 28th conducts approximately 50 tests annually. With only five operational suitability analysts assigned, it is not feasible to have an operational suitability analyst assigned to every project. We will continue to add more suitability analysts and increase our capabilities. As systems become more expensive to operate and test, we are examining modeling and simulation tools. These new capabilities would allow us to utilize data gathered from limited test resources and extrapolate the information to simulate additional test articles with high confidence levels, thereby modeling actual anticipated results in the operational environment. Our goal is to find the problems before the warfighter does.

Captain Garrison is the Operational Suitability Division Deputy Chief, Master Sergeant Clay is the Weapon Suitability Branch Chief, and Technical Sergeant Kile is the Integrated Avionics Suitability Branch Chief. All are career aircraft maintainers assigned to the Operational Suitability Division of the 28th Test Squadron at Eglin AFB, Florida.

Agile Combat Support: Linking Support and Logistics to Operations

Captain Robert C. Bearden, USAF

Proper Planning

If you have been around logistics for any length of time, you are probably familiar with the seven Ps of planning. Succinctly, the seven Ps state that proper planning prevents poor performance. (If you caught that only six Ps are listed here and you are not aware of the seventh, ask one of the old hats in your office or shop to explain it to you.) Regardless of how you say it or if you use a memory aid like the seven Ps to remember it, the importance of proper planning cannot be overstated. In fact, ever-increasing technological opportunities, an uncertain geopolitical environment, and the evolution of our truly expeditionary Air Force and airmen reveal this importance all the more. The capabilities that distinguish air and space power—speed, flexibility, and global perspective—are much needed in the current operational environment. These capabilities rely on the proper planning of combat support professionals because increases in responsiveness will come not only from flying farther and faster but also from those processes that ready the force and prepare the battlespace. To that end, we must resolve to improve responsiveness by providing logistics in a leaner and more focused manner and by ensuring all Air Force logisticians are trained and educated to do so. As combat support professionals, our focus is on being responsive to the creation of the desired operational imperatives (effects). It is critical that each of us is ready to plan and execute operations in today's demanding environment.

With that in mind, the intent herein is to examine the Agile Combat Support (ACS) operational concept of support so we Air Force logisticians better understand how our efforts support the needs of the combatant commander. As a starting point, it is important to understand a little more about ACS. There are six ACS master processes, and they each have roles in all operations throughout the spectrum of operations. Additionally, you see that the master processes employ a combination of functional competencies and capabilities to bring about desired effects. However, even with that graphic representation, you may still find yourself wondering, "Why are the master processes significant?" No other question in regard to creating responsiveness has greater significance.

The Master Processes: The Link

The master processes provide the framework for combat support professionals to examine our effects and capabilities and address questions like, Is the force ready, is the battlespace prepared, and is the force positioned? Consider for a moment the logistics lessons learned from Desert Shield and Desert Storm. While we were able to move a great amount of cargo to the theater to enable these operations, it is certainly questionable whether or not the force was positioned *effectively* or if the battlespace was prepared *properly*, because it took so long to move to the theater and longer still to sort equipment and get it to the right units. To illustrate further the importance of this type of question, consider the idea of forming and developing a prepositioning strategy.

The prepositioning of materiel in critical locations has become ever more important, mostly because we face an increased level of uncertainty. Our foe is uncertain; therefore, our environment, timing, duration, and scale and scope of operations are uncertain as well. The ability to respond in light of that uncertainty demands we create a more responsive force. To achieve that responsiveness, we must accept the fact that we simply cannot take everything with us. Couple this with a desire to achieve operational effects sooner and with the fact that our force today is so much lighter, leaner, and more lethal than it was throughout our Cold War heritage, and you have a rock-solid case for meticulously planned prepositioning. Unfortunately, we cannot afford to preposition everything we may desire to, and we certainly cannot preposition just for the sake of prepositioning. Instead, we must preposition materiel in a deliberate manner that ensures we answer the following questions: is the battlespace prepared in a manner that ensures our light and lean forces are mission-capable upon arrival, and can we maintain persistent operations for the duration of the fight until sustainment is established? Thus, the critical role of the master processes is revealed: they guide us in asking the right questions and ensuring we really have planned properly for an operation. With that understanding of the master processes and their importance, let us look at each of them briefly and further examine the art and science of planning and operating in today's environment.

Readying the Force

Truly, the heart of a ready force is one that is organized, trained, and equipped to bring about whatever effects our national command authorities may desire. That is simple to say, but in reality, the complex process of managing constant and dynamic change characterizes maintaining a ready force. Just as the geopolitical environment and technology are in a constant state of change, so too is our force. We see this change daily. On a given day, one weapon system receives a computer upgrade while another system is retired, or one airman graduates from a technical training course while another departs active service. This constant change requires us to make sure our force is truly ready, in peace and in war.

While each of the master processes plays a role in both peacetime and wartime, the process of readying the force, in particular, is most readily understood in its peacetime role. One could argue that this stems from the fact that we tend to be linear in our thinking. This linear thinking would cause us to understand readying the force as something that only took place in peacetime to prepare for wartime. But consider this, does readying the force continue throughout wartime as well? While it is beyond the scope of this article to deal with the specific definitions of *war*, it is certainly true that the Air Force is engaged in multiple operations that involve or support combat. Examples of these are Operations Iraqi Freedom, Enduring Freedom, and Noble Eagle, to name a few. Knowing this, consider also that even while these operations persist the Chief of Staff of the Air Force has told us that we need to "reduce the size of our active force by 16,000 people, and we must reshape the force to correct existing skill imbalances and account for a new range of missions in the GWOT [Global War on Terrorism]."[1] So even as operations continue, the Air Force is committed to creating and maintaining a ready force that meets the needs of the nation, even to the point of undertaking reductions. That should tell each combat support professional (and each airman) the force must be ready at all times and that it is critical to consider whether or not the force is ready, regardless of the state of operations. In peace and war, we must ensure the force is capable of providing the desired effects. At the same time, we must concern ourselves with the status of the battlespace.

Preparing the Battlespace

In asking whether or not the battlespace is prepared, the importance of planning is again revealed and begs another question: how do we *really* prepare the battlespace? Like so many things we do, preparing the battlespace is really a combination of several tasks and can be illustrated by a number of examples. Certainly, the building of time-phased force deployment data (TPFDD) is a critical element of battlespace preparation. When most of us in the profession of combat support think about a TPFDD, we picture an enormous spreadsheet with lines and lines of data. While that is an accurate view of the physical product of a TPFDD, in reality, it is much more. Beyond the lines of data and fields, like the ready-to-load date and required delivery date, is what is best described as a semiliving tool that aids us in positioning, tailoring, moving, and controlling US military forces worldwide. This tool enables us to do several things to prepare the battlespace: deconflict force movements, validate transportation requirements, and allocate means of transportation.

While the TPFDD is being created, we also must consider our strategy for sustaining forces as they take their places in the battlespace we have molded for them. Part of this strategy includes the prepositioning of materiel mentioned in an earlier example. Considering the few sites around the globe and the global nature of our service, it is obvious that prepositioning is key to preparing the battlespace. With the TPFDD created and a prepositioning strategy in place, we move into the processes that are best understood in the application of Air Force capabilities.

Positioning and Employing the Force

As we position the force, we begin to apply our strategies that were developed in Readying the Force and Preparing the Battlespace. It is at this point, one could say we cross the point of no return, and the true significance and outcome of our planning efforts begin to materialize. We begin to position the force by validating and executing the TPFDD. The validation process ensures the right equipment and people move in a correct and efficient manner, and of course, in the execution of the TPFDD, we see the actual movement of these forces. As our forces move quickly to the fight, it is imperative that we establish bases in a like manner. While many factors contribute to establishing and operating bases quickly, two are important to consider here: Force Modules and Basic Expeditionary Airfield Resources (BEAR).

Force Modules are groupings of unit type codes and capabilities that provide a logical flow of forces to open an airbase, establish command and control, establish the airbase, generate the mission, and operate the airbase. In positioning a force, the Open the Airbase and Establish the Airbase modules provide the primary support structure made up of mostly mission

support group and medical group forces, as well as BEAR assets. These modules establish the foundation for operations while the Command and Control Module and Generate the Mission Module supply the mission generation forces and associated maintenance and munitions forces. If we have planned effectively, then this force module structure promotes agility because the base is opened and established with only those forces necessary. Further, this ensures operational elements fall in on an established support structure and can begin operations immediately.

To ensure this capability at established and austere locations alike, BEAR assets are included in the Open and Establish modules and, in fact, account for most of the cargo in these modules. Our BEAR assets enable us to establish new locations rapidly or augment existing locations in preparation for operations and are critical to our ability to position forces effectively at the locations of our choosing.

With a ready force, positioned in a prepared battlespace, we then can employ that force in a manner our leadership sees fit. Most important, having properly planned and prepared, we are able to generate mission forces, recover those forces, and regenerate them at will. The ability to repeat this process with accuracy and lethality is truly a hallmark of the Air Force. However, the process does not stop there.

Sustaining the Force

The employed force was able to get in place quickly and engage immediately because it moved to the operation in a light and lean manner. The lean nature of the force ensures responsiveness and flexibility, while planning ensures that the force can be sustained. Earlier, I mentioned the importance of asking whether we can maintain persistent operations for the duration of the fight until sustainment is established. The fact is we can, but only if sustainment is established at the outset on day one of an operation. If we are truly going to fight in a light and lean manner, then sustainment operations must start at the beginning, or we will find ourselves constantly trying to catch up with operational needs. In addition to starting on day one, sustainment continues throughout the operation, as well as throughout the ACS master processes. While it was not dealt with specifically in the section on Readying the Force, consider the role of sustainment there as well. In designing and equipping tomorrow's force, are we not also developing tomorrow's sustainment? Along with the imperative of beginning sustainment at day one and continuing it throughout the operation, let us also consider an operational sustainment example to clarify the role of Sustaining the Force.

You surely have noticed by now that the theme of lighter, leaner, and faster bubbles up throughout this article and has in many Air Force conversations over the last several years. As mentioned earlier, the desire to become lighter requires us to strive continually for a more efficient means of moving and sustaining our forces. One method of sustainment that has proven successful of late is the Centralized Intermediate Repair Facility (CIRF) concept. This concept allows certain reparable items to flow back to a single repair facility in theater and eliminates duplicated repair efforts at multiple bases. Additionally, because in some cases reparable items like engines and pods are at a single location, the CIRF can respond more effectively to the needs of the combatant commander. This is one example of responsiveness that allows us to answer the imperative question: are we adequately sustaining the force?

Recovering the Force

The last of the master processes, like the others, cannot be overlooked. It would be nice to think we just could redeploy forces, either forward or to home station, and they would magically be restored to a particular level of capability. However, we all know that just is not the case. It is necessary to understand that our forces must be recovered to return them to some desired level of capability and prepare them for future operations. The other important aspect of Recovering the Force is that this process has a definite end point at which the force is recovered. From that point, increases or decreases in capability based on lessons learned can take place as the processes restart with Readying the Force.

While not a specific Air Force example, a good way to understand Recovering the Force and the distinction between it and Readying the Force is to consider a basketball team. Throughout the season, a team must recover to some level of capability after each game. This recovery typically does not include wholesale change; rather, it is characterized by returning to some level of readiness for the next game. As the season progresses, long-term plans for postseason play may take place and include large changes in capability as the team is readied for the long term. This playoff preparation represents Readying the Force whereas preparing for the next game represents Recovering the Force. With the process of Recovering the Force at a definite end point and the force back to some desired level of capability, the master processes begin with Readying the Force.

Prevents Poor Performance

Hopefully, this quick look at the ACS master processes has given you some insight into how ACS provides support to operational commanders, as well as an understanding of the processes themselves and the questions those processes allow us to ask. By asking the operationally imperative questions associated with each of the master processes, we benefit from an established framework of support that ensures proper planning on our part. Certainly, being able to think in terms of the processes with an understanding of the role of each in all kinds of operations allows combat support professionals and operational warfighters alike to better understand the expectations, importance, and needs associated with operational support. This perspective is a good first step for each of us in preventing poor performance on our part as individuals and as a professional community.

Notes

1. CSAF Sight Picture, 29 Jan 04.

Captain Bearden is a logistics readiness officer currently serving as an intern on the Air Staff. He is assigned to the Planning, Doctrine, and Wargames Division, Directorate of Logistics Readiness, Air Force Installations and Logistics.

EXPLORING THE HEART OF LOGISTICS

Smarter Not Harder: Improving the Wheel and Tire Buildup Process

Captain Jason York, USAF
First Lieutenant Garrett Knowlan, USAF

The men and women of the 62d Maintenance Squadron Wheel and Tire (W/T) Section at McChord AFB, Washington, working hand in hand with the Flight Support Section of the 62d Logistics Readiness Squadron, have developed and implemented a textbook example of lean logistics. Their innovations have reduced the turn time for W/T assemblies from 7-¾ hours to 2-½, a reduction of more than 66 percent, while making 6 of the 11 authorized persons available to support other requirements.

Simply put, the old way of doing business would not allow them to keep up with the current demand. The shop is the sole supplier of C-17 W/T assemblies for McChord and the entire Pacific Theater. Even with the demands of the Global War on Terrorism, shop personnel were able to build up (excluding leak check) 59 W/T assemblies in 6 hours with no notice and allow the 62d Airlift Wing to respond to the December 2004 South Asian tsunami tragedy with 75 sorties of humanitarian relief. Without this team's innovation, lack of W/T assemblies eventually would have slowed the wing's response.

Prior to 2002, the process of building up and breaking down the tires was 100-percent manual, backbreaking labor. Members used a generic 1965-model bead breaker (a relic of the C-141 days), which required them to balance a 400-pound-W/T assembly on a 10x10-inch platform and hoist it 2 feet off the ground. This posed a safety hazard, as tires often fell from the breaker. Once the wheel was separated, members had to spend 30-plus minutes manually cleaning a set of 18 bolts to prepare them for NDI, where half would be returned requiring additional cleaning. This was also a safety concern as the members were exposed to cadmium (carcinogenic).

To clean the wheel, the technicians had to lift the 160-pound halves manually 4 feet to place them in the jet washer. Once clean, the wheel halves were removed manually, placed onto a trailer, and transported to NDI. Once inspected, the wheels were placed back on the truck and returned to the W/T shop for the buildup process. In an average shift, members would lift 30 wheel halves manually six times, accounting for more than 28,000 pounds of lifting per person in 1 day!

The buildup of a new W/T assembly was just as physically grueling, requiring several steps of lifting and moving the heavy assemblies. First, two members would lift the wheel halves up to the tire. The wheels then were secured to the assembly by manually torquing 18 tie bolts to 175-foot pounds with a 15-pound torque wrench. The members did this while crouching on the floor in a very uncomfortable, awkward position. After completion of the torque, the tire was moved to the inflation cage. This process required an individual to monitor the inflation manually, shutting off the valve to read the pressure. When operating at maximum efficiency, the buildup or teardown process required lifting 100-160 pounds 14 times. Back injuries in the section were commonplace, requiring an average of 6 weeks of light duty per year. From 2000 to 2003, the Logistics Readiness Squadron and the Maintenance Squadron had 12 documented mishaps entailing serious back injuries, broken bones, and equipment damage as a result of the W/T production process. As the operations tempo increased, the day-to-day operation of manually breaking down and building assemblies crushed the morale of the section. These conditions motivated both the Logistics Readiness Squadron and the Maintenance Squadron to seek a better way.

Shop personnel took the lead in the wing by using lean logistics concepts to trim inefficiencies from the process. After transitioning to a larger facility, imagination and leadership support became the only limitation—and the W/T Section had plenty of both. After researching many corporate wheel and tire facilities and highlighting the latest available technology, the Maintenance Flight leadership relayed their pioneering ideas to supervision, who received them with enthusiastic approval. The process had begun.

The first area for improvement involved equipment. Personnel researched and acquired a new bead-breaking system certified specifically for the C-17A. With the new machine, technicians simply roll the 400-pound assembly onto the device and break the bead 3-5 minutes faster without ever lifting the tire off the ground, eliminating a significant hazard. A local contractor then

installed a ceiling hoist system, which lifts the 160-pound wheel halves into and out of the washer with no physical strain on the individual. It also allows members to guide wheels effortlessly through the shop with minimal physical exertion. Shop personnel then located an ultrasonic washer, which reduced the labor needed to clean the tie bolts from 30 minutes to 30 seconds (the time required to load the washer). The washer also cleans the bolts to NDI standards the first time, every time.

The two-person, manual torque procedure was replaced by the Wheel Assembly Torquing System—a machine that hydraulically lifts the W/T assembly and allows one person to mechanically torque the entire assembly in less than 2 minutes. The new torque system automatically applies the prescribed torque simultaneously to two tie bolts opposite one another and eliminates human error and fatigue. An additional, computer-monitored servicing cage was added to allow for the concurrent servicing of tires, which turns off automatically when complete. This allows personnel to roll the W/T assembly into the cage, press start, and move on to the next buildup.

After a thorough *leaning out* of the buildup and teardown processes, the team redefined its relationships with outside agencies. One of the most labor-intensive steps (and the leading cause of injury to personnel and damage to equipment) in the lengthy process involved transporting the wheel halves and tie bolts to NDI. The solution to this problem was quite simple: instead of bringing the items to NDI, members set up a station in the new facility and enabled NDI personnel to perform their inspections in the W/T Section. The wheel halves are now delivered directly from the washer to an NDI station via the hoist. In addition to eliminating damage and injury, this innovation allowed W/T technicians to remain in the work area and eliminated a major inefficiency from the process.

With a new facility and a more efficient process, asset distribution then remained the only issue. This challenge was met by establishing a consolidated supply point within the facility and submitting a work order to Civil Engineering to construct an overhead mezzanine with a service elevator for storage of built-up assemblies. When a customer orders an item, a technician walks upstairs, rolls the asset to the elevator, and lowers it to the shop floor. There is literally no wait time.

The airmen on the floor who saw a better way were the backbone of this effort. By utilizing teamwork and initiative, Team McChord developed a process that is the benchmark for Air Mobility Command.

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High-Altitude Intercontinental Precision Airdrop: A Revolution in Mobility Affairs (Could AMC Learn from the B-2 PGM Model?)

Major Peter A. Garretson, USAF

The union of precision-guided munitions (PGM) and stealth technology has brought about a revolution in military affairs that has affected the way we conduct warfare dramatically. In a recent visit to Dover AFB, Delaware, Secretary of the Air Force James Roche noted that with just a few B-2 aircraft armed with PGMs a small number of aircrews could carry out most any off-the-shelf war plan. Imagine several long-range intercontinental bombers launched from the continental United States (CONUS) delivering enough ordnance to have a strategic impact in just one sortie. Could such a model be expanded to airlift platforms? Why not?

Capability currently exists for strategic airlift assets to deliver airdrop loads from CONUS to overseas locations. These same assets are capable of precision airdrop. This concept is similar to—but not exactly—the scenario described by Roche. B-2s deliver explosive ordnance—airlift platforms generally do not. So why use strategic airlift assets to carry out an airdrop mission with impact at the strategic level?

Mobility may be less glamorous than dropping bombs, but airdrop has proven vital during Operations Desert Shield; Desert Storm; Iraqi Freedom; and particularly, Enduring Freedom. Airdrop can provide the sole method of resupply in a landlocked theater of operations and is likely to become even more critical in future conflicts given increases in range, speed, and responsiveness.

If Enduring Freedom and Iraqi Freedom are decent indicators, we can expect operational plans to be carried out by geographically dispersed, highly mobile land units that consume expendable material as fast as they move. Future wars likely will resemble Iraqi Freedom in that they are waged with comparatively small numbers of US troops moving across vast distances without completely secure supply lines. Future operations will take place in areas where land-based supply lines are highly vulnerable to disruption as experienced during Iraqi Freedom. These attributes make aerial resupply an attractive prospect.

Tactical airlift aircraft require a significant in- or near-theater infrastructure to be built, seized, borrowed, or even leased. Transloading from strategic aircraft adds complexity, slows velocity, and multiplies the number of sorties. Building airfields is not cost-effective, seizing airfields has risks of its own, and borrowing or leasing becomes more difficult as basing options dwindle and fall victim to the winds of political and public opinion. Fixed bases also must be defended and forces tied down for this task. Further, operating airfields on foreign soil is increasingly risky with the ever-increasing danger of man-portable air defense systems. An option not requiring fixed overseas bases or airfields would have appeal.

The argument can be made for intercontinental precision airdrop based on these trends. How then would it be accomplished? Let us look at some options:

- One approach would be to develop this capability with current airframes and packaging systems. This pragmatic and useful

approach is being pursued by the Joint Precision Airdrop System (JPADS) Team, which already has demonstrated significant success with global positioning system (GPS)-guided parafoils dropped from altitudes as high as 25,000 feet. Pragmatic as it is, approach ultimately is limited by the platforms already in place, which were designed and optimized for a different mission. For instance, using multiple air refuelings, a current strategic airlifter *could* deliver JPADS loads directly into the theater, but this is an inelegant solution. No current airlifter is stealthy, all are comparatively slow, and each would require multiple air refuelings, which add stress, complexity, and additional points of failure to an already dangerously long duty day, all to deliver, at most, 36 pallets of equipment (C-5) or 18 (C-17). Then, too, such loads cannot be rearranged easily, if at all, and the tremendous rigging complexity, manual actions required, and lack of oxygen and low temperatures make the cargo compartment a dangerous place to work.

- Another approach often used by the Air Force is to build a system from scratch, specifically to meet a given mission—in the process designing out exactly such legacy problems. This is done by imagining what capability that does not exist today but one that would significantly increase our advantage and then designing the ideal force structure necessary to meet this capability; study its utility and feasibility; and hopefully, program it into future budgets. In this way, many cumbersome aspects inherent in the former method can be eliminated by intelligent design: complexity of rigging, pressurization complications, center of gravity and airspeed complications, difficulty shifting around loads, mission complexity, and insufficient stealth, range, and payload cease to be complications because we design them out.

What then are the critical components to such a capability? First, a precision-containment system must be created; second, a suitable delivery system must be designed; and finally, an information infrastructure must be created to make use of it. The ideal containment system would be a rapidly sealable aerodynamic container made of low-cost material, coupled with an inexpensive, expendable high-altitude, low-opening (HALO) guidance and parachute package. The ideal delivery system would be low-observable, intercontinental, high speed, and multipurpose. The ideal information infrastructure would link users on the ground to aircraft and inventory in the air. What follows is a vision of what high-altitude intercontinental precision airdrop might look like in the not too distant future.

It is 2025. Our future aerial porter accepts the tailored, daily expendable packages from the Army user. A small, field-deployable unit vacuum shrink-wraps the items and wraps them in a thin but high-tensile-strength Kevlar expendable harness. The package is then wrapped in Tyvek wrap,[1] which comes in a standard roll. It is zippered together to the appropriate length, and one of several standard-sized circular or hemispherical ends are zippered or laminated on. Air is then used to inflate it before it is filled with fast-drying, impact-protective foam that fills out its aerodynamic, bomb-like shape. A wireless radio card is affixed giving an exact inventory of the device and user and delivery information, as well as its weight and fragility.

This airlift *dumb bomb* is now affixed to a low-cost tail cone that supports simple GPS-guided, glide-bomb fins and a parachute by means of the Kevlar harness. The radio card tells the tail cone how to calculate proper deceleration. Despite its

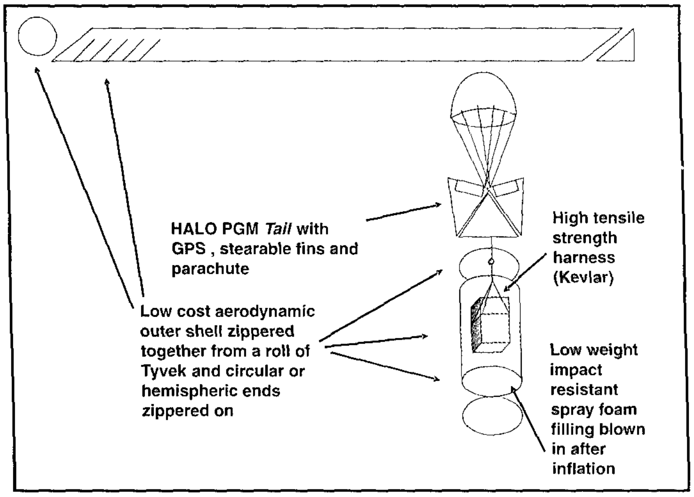

Figure 1. HALO Pack[2]

sophistication, the use of common commercial materials and the low cost of GPS and radio-controlled model aircraft technology means the end cost is far below the cost of pallets, chains, devices, and netting.

Our aerial porter places the airlift bomb face down on the coatrack loader and then drives it out to the jet. The jet of 2025 is quite different from previous airlift platforms. First, it is quite a bit larger with a huge, intercontinental stealth flying wing. Second, because it is a span-loader, a blended-wing body, it has no fuselage and is loaded across the wing. Third, because there are no pallets to push, all cargo is loaded from a mobile coatrack to an automated coatrack not unlike devices used at your local drycleaner. There is also no paperwork—a wireless local area network (LAN) automatically calculates maximum takeoff weight given predicted environmental conditions and mission profile, updates the load plan, and loads all allowable payloads in accordance with the air-tasking order.

About that time, the aircraft commander arrives at the jet, although he does not have to. The jet can be piloted remotely via satellite, but this is a currency sortie for him, since pilots are still required for countries that do not allow unmanned overflight. AMC/A37V still requires pilots when dropping or exfiltrating troops. The flight deck he steps onto is a removable (and ejectable) module with a common suite of avionics that can *plug and play* into this aircraft, as well as a faster, high-altitude, hypersonic version that is used when loads are smaller but response time is more critical. The avionics suite allows our pilots to maintain one type rating—reducing training costs.[3] However, in most cases, the tremendous weight of his instrumentation, life support, and creature comforts could be used for additional payload or fuel.

He places his mission planning tablet computer into a secure cradle, and the flight management system immediately displays his mission profile in clear graphics and all sources of potential problems: weather, terrain, special use airspace, and other aircraft. Takeoff and landing data are calculated using environmental conditions pushed to the jet from the weather server on the wireless LAN, and center-of-gravity conditions are calculated by the *coatrack* and wireless radio cards on individual pallet bombs. The pilot looks at his graphical situational picture, verifies that all parameters and systems show green on the mimic display, and then presses verify to file a flight plan wirelessly. One button

starts and configures the aircraft for taxi and takeoff, and off he goes.

It is a lousy night, so he is happy he has the full-time artificial visual flight rules, panoramic heads-up display, which provides an outside picture by fusing several sensors (millimeter wave radar, infrared, visual) with a computer-generated landscape based on a laser-ring gyro inertial navigation system/GPS position and terrain and map model. The pathway in the sky has simplified currency requirements, since the aircraft is entirely autonomous of any non-GPS navigational aids, and the Enhanced Vision System[5] means that he is never really in instrument conditions where he cannot see the ground or runway. He chuckles, listening to the old guys in the Dadaelians talk about diverting for weather—nobody he knows has ever done that.

Not that he has much opportunity to land at fields other than his home station; since the linkage of an intercontinental *bomber* with HALO airdrop, there is a much reduced need for foreign airbase support.[6] The reduced need to land anywhere also means that the aircraft could be built larger (maximum payloads ranging from 300,000 to 1 million pounds with wingspans as large as 330 feet) with only a limited number of bases capable of supporting such large aircraft.[7]

Such size, range and loiter time, and fuel load, as well as the wide range of speeds offered by oblique wing geometry, have made it attractive for dual-use missions, such as aerial refueling and an airborne platform for sensors and C2 apparatus. The modular nature of its design allows any number of sensors and communications equipment to be affixed to the aircraft to refresh the common operational picture (COP) with airborne or ground radar or imagery or to serve as an intheater *satellite* for relay of electronic communications. Or, just as quickly, multiple boom modules can be affixed that turn it into a very capable multiple-point refueler. Thankfully, those long missions usually are done remotely, mercifully, leaving these shorter vanilla legs for such currency missions as today.

Once his jet reaches altitude, the huge wing actually pivots to fly obliquely—this allows him to fly at a faster speed with less drag, making the trip much shorter.[8] Once he arrives at the area of responsibility, he swivels back to become a huge motor-gliding wing to stay stealthily at a very high altitude and loiter for the longest possible time. This allows him to stay high above the threat, even if it could see him.

On the way, he amuses himself by watching the mission sequence and configuration screen change and change, as users update their requirements. His target sequence is driven by a common operational picture that securely monitors and reports the status of all expendables by operational units, minute by minute, as well as the exact spots where the ground units want the packages placed.[9] Like modern department stores, the inventory on his jet is a masterpiece of just-in-time warehousing, to supply on-demand airlift, much like a close air support asset orbits waiting for a request. Some packages on his jet are general—fuel; bullets; water; gas; oil; repairs; meals, ready to eat. Others are more specific to the units. The commanders on the ground constantly scrub the order of battle and the air-tasking order to determine the optimal sequence of supply.

The first sequence is now finalized, and the various coat-hanger loaders move the appropriate package into position for drop and program the precision tail cones with the GPS coordinates to hit the altitude of the ground and the requested altitude for chute opening. One after another, the on-board targeting computer releases each as it approaches the optimal place to ensure the smallest circle of probable error. This is a typical delivery mode: HALO. The pilot hears the faint buzz of the coat-hanger loaders whirring as they move the appropriate containers into position but never notices any significant change in the center of gravity, despite the fact that packages are being dropped from several points near simultaneously.

Each of the inexpensive tail cones correctly guides its container to its mark and opens the parachute so it makes a soft landing and is recovered by friendly forces. They cut through the Tyveck and foam and get the gas, water, or tools they may have requested only minutes ago. Some critical packages incorporate a self-destruct or beacon for destruction devices should it malfunction and fall into enemy hands. But no such mistakes happen on this mission. The system is even capable of dropping a capsule full of troops, but it hardly is a preferred method of insertion. Troops generally prefer to be inserted via a stealth motor glider, which is airdropped from the SuperGalaxy, and then glide silently to insert an entire special operations force into precise locations.

Like troops, some payloads are especially sensitive to landing, and in these cases, there are several other specialized unmanned gliders that can be dropped. The Space-Saver motor glider is used to save space and extend range—it is stored, deflated, and powered by a short lifetime pulsejet similar to the old German *buzz bombs*.[10] These tiny engines have one or no moving parts. They are ignited as they drop and then slowly inflate a lightweight air-pressurized wing and tail, which is then GPS-guided to its eventual target. The advantage of such devices is that they can be used several times, and field users can use them to launch items out of the theater.

One or two such sorties are capable of supplying the entire expendable needs of the theater for a day.[11] The need for tails—at least for delivery—is greatly reduced. Because of the link to the common operational picture and the ability to deliver just in time directly, there is little need for on-the-ground warehousing, and often, it is literally as simple as the user's saying, "Need more bullets," to his terminal, and the aircraft saying, "Here you go." After all specified packages are dropped and all required resupply is filled, orders for *seconds* are taken and dropped before flying home and letting the next aerial resupply bomber take over.

How far away is this vision? The oblique all wing (OAW) platform envisioned above does not exist today, and it presently is not being developed within the Department of Defense, but its production is well within our nation's current technological capability.

While other platforms—such as more traditional span-loaders, blended-wing bodies, airships, and even conventional airlifters—certainly could be adapted to drop airlift as a bomber drops bombs and, perhaps, even offer equivalent payload and range, they likely would never equal the OAW in speed, stealth, or endurance.

The concept of the OAW was originated by the father of the sweptwing, the late National Aeronautics and Space Administration (NASA) engineer R. T. Jones, who first recognized the advantages of combining *the* most efficient aerodynamic shape with *the* most efficient wing loading.

Between 1952 and the present, NASA has conducted numerous studies on the oblique wing designs, including a

passenger OAW design that could carry more than 300 passengers distances of 6,000 miles at speeds up to 1.6 mach.

The outstanding aerodynamics of OAW theory were validated both in wind-tunnel testing and in a radio-controlled scale-model UAV. Economic studies showed that even at supersonic airspeeds, this vehicle could be operated 30 percent cheaper than 747s carrying an equivalent load over the same distances and still land and take off on existing runways—with lower power at takeoff and less noise.[12]

Seeking to find solutions to airport congestion, NASA studied the viability of a cruiser-feeder concept, where more traditional aircraft actually would land on top of the OAW and transfer cargo, passengers, and fuel. NASA concluded such a pairing would offer good flight characteristics and that there existed no technical showstoppers. Such capabilities further would offer advantage to an OAW design, creating entirely new possibilities for exfiltration and back lift.

Up until now, the OAW was unattractive *not* because of technical difficulties but because such an aircraft, with a wingspan of more than 500 feet, would force significant redesign of the existing infrastructure; was a radical departure in design for a market based on passenger confidence; and such a radical design would have little tooling in common with previous designs.

But military need, not passenger confidence, drives military airlift, and very large aircraft such as the AirBus 380 inevitably will drive changes to our future infrastructure to accommodate their larger wingspans.[13] The problems engendered by the OAW's very large wingspan are primarily during ground operations—such an aircraft easily could land on existing runways, but their wings would overhang adjacent taxiways. If the OAW was operating primarily as an intercontinental strategic airdrop platform, it might only require one or two custom airfields to undergo significant redesign.

Considering the mix of stealth, range, speed, payload, and loiter and the fact that it has been so well studied and is clearly within our present technological reach, the OAW deserves a dedicated study by the Secretary of Defense Office of Transformational Strategists; Under Secretary of Defense for Advanced Systems and Concepts; Deputy Chief of Staff of the Air Force for Plans and Programs, Strategic Planning Directorate; US Transportation Command; and Air Mobility Command (AMC).

High-altitude precision airdrop is even nearer to reality. Recognized as a critical capability by the Joint Requirements Oversight Council, JPADS was approved for fast tracking[14] by the Deputy Secretary of Defense for Advanced Systems and Concepts for Advanced Concept Technology Demonstrations[15] and has demonstrated noteworthy success.

High-altitude precision airdrop is considered necessary to enable the Army's vision of a revolution in military logistics for the Army After Next, where it wishes to be able to insert a combat force—the interim brigade combat team (IBCT)—into a theater within 96 hours, even when limited by maximum on ground,[16] and afterwards to resupply these highly dispersed teams, fort to fighter, via a concept they call Integrated Logistics Aerial Resupply.[17] It, too, sees precision airdrop as the answer.

While JPADS packages are not yet in the type of disposable aerodynamic containers described above, JPADS-guided parafoils have demonstrated the capability to drop 10,000-pound packages 25,000 feet from existing airlift platforms, landing with accuracy within the Army's required 100 meters of circle error probable and an offset up to 25 nautical miles.

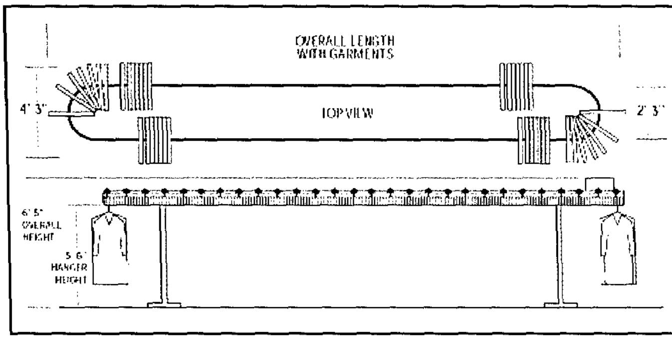

Figure 2. *Coat Rack Loader*[4]

Sophisticated new software integrates real-time wind data from numerous sources—GPS dropsondes, radar, and light distance and ranging—via an encrypted datalink, then calculates computed aerial release points, as well as probable landing areas for unguided or failed chutes. The JPADS team also has developed a concept of operations that closely mirrors the close air support model of providing resupply just in time rather than just in case. But most important, one commercially produced JPADS system, the Sherpa, already has been used operationally to resupply Camp Korean Village in Al Anbar Province, Iraq. On 9 August 2003, two Sherpa-guided parafoils were dropped from a Marine KC-130 more than 5 miles high and landed within 200 meters of the targeted drop point.[18]

While the current cost of expendables is extremely high—on the order of $3-5 per pound—this cost must be balanced against the staggering cost and risk of building up, maintaining, and protecting aerial port and convoy delivery infrastructures on the ground (including loaders; fire and fuel trucks; petroleum, oil, and lubricant facilities; and lodging) and the fuel of landing and taking off for both the strategic and tactical airlifters. Building up and swapping out such infrastructures takes up a large portion of military lift as it is. Also, consider that airdrop expendables are much easier to budget for and replace than the platforms and personnel who drop them—the cost and trouble of high-altitude airdrop seem much more attractive when balanced against the loss of an aircraft and crew. What is needed now is for the Air Force to finalize and embrace the high-altitude precision airdrop concept of operations, approve the JPADS for operational use on Air Force aircraft, and begin studies and programming for a dedicated airdrop platform. The JPADS program, for its part, needs to continue for some time to come in order to improve the reliability, cost, accuracy, and payload for the current crop of platforms and begin design of the next-generation precision airdrop containment system, focusing on an order of magnitude reduction in cost and rigging complexity.

By unifying the capabilities of high-altitude precision airdrop with a dedicated intercontinental delivery platform, information infrastructure, and appropriate doctrine, the revolution in military affairs exemplified by the union of the B-2 and PGM could be expanded to create a revolution in military logistics allowing just-in-time delivery, from fort to fighter ultimately

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An Alternative Vision for CBM+ for the Air Force

Bill Hale, AFIT

A review of the Condition-Based Maintenance Plus (CBM+) Web site[1] and the Air Force plan to implement it has sparked a careful appraisal of the implementing strategies. Having a clear strategy and metric to achieve the present CBM+ vision is axiomatic to success. The following highlights an alternative vision to what the Air Force currently plans to pursue, gleaned from the pertinent Web site.

The first problem concerns the definition of CBM+. One notes from the study[2] performed to address CBM+ that the definition comprises 72 words in three sentences, plus an additional sentence yet to be defined. The gist of the definition is to perform maintenance (Mx) only when needed, as indicated by sensors, portable equipment, and other software-intensive *tools*. The underlying assumption here is that *expert knowledge* can be programmed into successive generations of these tools on a timely and cost-effective basis.

Since CBM+ is defined in the Deputy Under Secretary of Defense, Acquisitions and Logistics memorandum (same subject), November 2002, in terms of reliability-centered maintenance (RCM), perhaps a more pragmatic approach would be to use SAE Standard JA1011, *Evaluation Criteria for Processes*, as a guide. As in the present initiative in the Air Force propulsion community to implement RCM, the wider Air Force Mx community should mimic an end-oriented strategy. Succinctly stated, Air Force propulsion RCM is a structured methodology applied to engine components to maximize operational availability, at least life-cycle cost, consistent with *minimizing consequences of failures*. One can readily see that the former definition is whiz-bang technology-oriented (sensors, s/w, palm-pilots, and so on). The latter is aligned with private industry's reckoning to maximize utility at the least cost by focusing on *consequences of failures*, not how quickly a remove-and-replace (R&R) action can happen.

In the propulsion world, having sufficient safe and reliable war-readiness engines to fight a major two-theater war scenario—available at least LCC—is the overriding goal. One accomplishes such an operational requirement, initially, by increasing the time on wing of each engine via planned maintenance while pursuing the elusive cost-per-engine operating-hour metric for each type-model-series engine. The present CBM+ study and Air Force Web site intend a different approach, apparently. Said approach seems to emphasize shorter R&R actions via increasingly integrated systems' fault isolation technology. The assumption behind this strategy may be that more software and hardware integration is better. The logical conclusion of this approach is to separate the maintainers and their hard-won technical skills from the R&R system, essentially making the R&R function robot-like. Perhaps this is a logical outgrowth of drastically shrinking personnel numbers in outyear Air Force budgets for Mx communities.

Now, consider the fact that this Web site study is almost mute on CBM+ education. Although *training* appears quite often in the study, the context is always in terms of simulators, hands-on with portable troubleshooting devices, and so forth. Contrast that omission to the following. In the present propulsion RCM world, Air Force Senior Executive Service (SES) members deliberately chose to "stand up RCM in the proper manner."[3] This choice involved funding Air Force Institute of Technology (AFIT) School of Professional Continuing Education instructors to travel to depot sites where propulsion engineers reside, as well as active, reserve, and Air National Guard bases where the maintainers perform field maintenance on engines. Called RCM course directors, these teachers provide tailored education appropriate to accomplishing the end goals of the SESers by conducting courses at 77 bases and 2 depots. The cost per student has been held very close to $100 per student the last 3 fiscal years, while providing education on a different tool at each respective location pertinent to the activities and responsibilities of each student. This education exceeds *training* because one of the goals of these SES-sponsored RCM curricula is to *change the culture* of the propulsion community from a *reactive* maintenance philosophy to a proactive *planned maintenance* philosophy. This approach stands in stark contrast to the Air Force Web site's apparent approach of business as usual, only faster and with less human interaction. To summarize, tailored education is a very long-term approach to changing the culture and is governed by the speed at which *growing* the tools increasingly fine-tunes the tempo of engine availability to the air expeditionary forces.

The author's intent is not to criticize the present CBM+ efforts of the Air Force. The author wants to spark some meaningful discussions in future editions of Air Force publications over what the role of CBM+ is for the Air Force in the long run and how best to accomplish this goal. We have time to ensure that we are pursuing carefully thought-out approaches to what we covet as

the end goals in the Global War on Terrorism. On one hand, if CBM+ is an approach to decrease Mx personnel and minimize troubleshooting R&R to the least value afforded by whiz-bang technology, then the present strategy seems very workable and probably cost-effective, given the dearth of funds committed to implement CBM+. On the other hand, if the alternative approach of focusing on *failure consequences* is adopted, thereby enlarging responsibilities of the Air Force Mx personnel, then clearly a large deviation from the present CBM+ implementation path must be adopted. The former is attainable at definable costs in the short term. The latter is attainable at variable costs in the longer term. Such results depend on actions implemented by Air Force senior level decisionmakers and shakers—and continuity of the same.

Here's hoping that they are listening to the forthcoming debate that this article is designed to encourage.

Notes

1. [Online] Available: http://www.acq.osd.mil/log/logistics_materiel_readiness/organizations/mppr/html/cond_based_airforce.htm.
2. Capt Timothy Smith, "Air Force Condition-Based Maintenance Plus (CBM+) Initiative," AFLMA Report (LM200301800), Air Force Logistics Management Agency, Maxwell AFB, Gunter Annex, Alabama, Sep 03.
3. SESers Tim Dues, Propulsion Product Group Manager, and Otha Davenport (Retired), Technical Director of Air Force Engines, prepared remarks to LOG 032 and LOG 033 RCM classes—videos shown from 2000 to the present.

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("Supplying ERG Supply-Chain Management Solutions" continued from page 29)

The overall percentages of functional similarity between the commercial and Air Force systems are presented in Table 2. Based on the data collected, all three commercial packages are capable of performing a majority of the 290 GATES and CMOS transportation functions. However, SAP has the highest percentage of similarity with CMOS, GATES, and an Air Force combined system. Oracle was identified as having the second highest degree of similarity followed by PeopleSoft.

To summarize, SAP has the highest percentage of similarity with the Air Force systems out of the three commercial software packages evaluated in this study. Although SAP is unable to achieve 100-percent functional similarity, it is the only package that has at least some degree of similarity in all 11 functional areas and scored the highest in percentage overlap with the Air Force software packages. Therefore, based on this initial study, it seems that SAP would be the best candidate of the three if the Air Force chooses to adopt a commercially provided ERP SCM system.

	CMOS	GATES	Air Force
SAP	95.45%	90.95%	90.69%
Oracle	89.39%	73.25%	74.48%
PeopleSoft	71.21%	60.49%	63.45%

Table 2. Percentages of Overall Functional Similarity

Conclusion

The purpose of this research was to identify commercially available ERP-based logistics software packages and determine whether they are capable of providing the same functionality as the two Air Force transportation information systems currently employed. Information on the logistics software provided by SAP, Oracle, and PeopleSoft was collected and a gap analysis was conducted to identify the degree of similarity between the Air Force and commercial systems. The results of the research indicate SAP provides the highest percentage of similarity with each of the Air Force systems, followed by Oracle and then PeopleSoft. Although all three software packages provide a substantial number of functions found in GATES and CMOS, none of the systems offers 100 percent of the transportation functions provided by the current Air Force systems.

As with all studies, several limitations were encountered during the research. First, the 290 transportation functions of GATES and CMOS were used as a baseline and compared with the commercial software packages. This study did not consider whether the commercial software could provide additional functionality that might be beneficial to the Air Force. Another consideration is that the 290 transportation functions identified as the baseline for the study were collected from AFLMA's 2001 study.[44] Although contact was made with each system's program management office to verify that all the functions were still current, the system contractors could be creating new or updated functionality that could change the results of subsequent studies. Third, the authors occasionally had to use professional judgment and experience when deciding whether a specific software package could perform a certain transportation function. For example, one function within surface cargo processing is the ability to generate human remains messages. Although PeopleSoft might not have a function that specifically states "human remains messages," it does have a message-generating capability. Since the company is able to provide the functionality, all it would need to do is customize the program to meet the Air Force's specific needs. Finally, only three commercial logistics software packages from the largest providers were included in this study. By incorporating more companies that offer logistics software packages, the authors may have found software packages providing more functional overlap than these three.

This study demonstrates COTS enterprise solutions exist that may be applicable to Air Force logistics processes and may provide a feasible approach toward achieving a single, integrated logistics information system. Furthermore, the results may serve as a useful foundation for AFLMA's 8-year project, which is intended to determine the information needs of the Air Force

logistics community before adopting a commercially provided ERP system.[45]

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JL
AIR FORCE JOURNAL of LOGISTICS
Volume XXVIV,
Number 1
Spring 2005

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